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314	This updated draft version of the Mission Requirements Document (MRD) called MRD-2B was prepared by the NOAA's Satellite, Data, and Information Service (NESDIS) and describes the National Oceanic and Atmospheric Administration's (NOAA's)	This updated draft version of the Mission Requirements Document (MRD) called MRD-2B draft (MRD-2B to be released in March 2005) was prepared by the NOAA's Satellite, Data, and Information Service (NESDIS) and describes the National Oceanic

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	plan for implementation of the Geostationary Operational Environmental Satellite (GOES)-R Series System. The MRD-2B addresses the geosynchronous-earth-orbit (GEO) needs of NOAA, as described in the GOES Program Requirements Document - 1 (GPRD-1) released June 14, 2004 and the GPRD-1a draft. The GPRD-1 reflects NOAA's users needs and updates the Geosynchronous Operational Requirements Document I (GORD-I) released December 2, 2002. The MRD-2B details NOAA's requirements to NASA for the instruments and to the prime contractor for the system. Subsequent lower level documents written by NASA will reflect NOAA's instrument needs to the instrument vendors.	and Atmospheric Administration's (NOAA's) plan for implementation of the Geostationary Operational Environmental Satellite (GOES)-R Series System. The MRD-2B addresses the geosynchronous-earth-orbit (GEO) needs of NOAA, as described in the GOES Program Requirements Document - 1 (GPRD-1) released June 14, 2004. The GPRD-1 reflects NOAA's users needs and updates the Geosynchronous Operational Requirements Document I (GORD-I) released December 2, 2002. The MRD-2B details NOAA's requirements to NASA for the instruments and to the prime contractor for the system. Subsequent lower level documents written by NASA will reflect NOAA's instrument needs to the instrument vendors.
316	Throughout this document, "will" implies a fact, while "shall" implies a requirement. Subsequent versions of the MRD will use shall for all requirements. All instrument requirements contain at least the word (THRESHOLD) and may contain the word (GOAL), distinguishing between the necessary and the desirable requirement. The term "TBD," meaning "to be determined," applies to a missing requirement means that the contractor <u>should</u> determine the missing requirement in coordination with the government. The term "TBS," meaning "to be specified," indicates that the government will supply the missing information in the course of the contract. The term "TBR," meaning "to be reviewed," implies that the requirement is subject to review for appropriateness by the contractor or the government. The government may change "TBR" requirements in the course of the contract. The GOES Program office will be maintaining control over the supplied values that are TBD in the GPRD products. Many of	(Throughout this document, "will" implies a fact, while "shall" implies a requirement. Subsequent versions of the MRD will use shall for all requirements). All instrument requirements contain at least the word (THRESHOLD) and may contain the word GOAL, distinguishing between the necessary and the desirable requirement. The term "TBD," means "to be determined," applies to a missing requirement means that the contractor <u>should</u> determine the missing requirement in coordination with the government. The term "TBS," meaning "to be specified," indicates that the government will supply the missing information in the course of the contract. The term "TBR," meaning "to be reviewed," implies that the requirement is subject to review for appropriateness by the contractor or the government. The government may change "TBR" requirements in the course of the contract. (The GOES Program office will be maintaining control over the supplied values that are TBD in the GPRD products. Many of these values will require detailed study over the period of several years to

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	these values will require detailed study over the period of several years to assess the capability of the system, particularly when TBD was used for product accuracy values.	assess the capability of the system, particularly when TBD was used for product accuracy values.)
321	The document has 4 sections: the Introduction that overviews the mission and defines mission requirements, a Space and Launch Segment (section 2) and a Ground Segment (section 3) that consists of the following four functional groupings: 3.4) Mission Management (MM); 3.5) Product Generation (PG); 3.6) Product Distribution (PD); 3.7) NESDIS Infrastructure Interface and 4.0) User Education and Training Segment. Between each of the segments, there will be an interface. The details of each interface will be detailed in separate interface documents. The Space and Launch Segment includes the spacecraft, instruments, entire communications payload services located on the spacecraft, on-board processing systems, and launch vehicle. The Space and Launch Segment contains on-board processing systems include feeding the instrument data to the communications system and in parallel feeding the telemetry and command information to the communications system, calibration, and other functions. The Mission Management (MM) functional grouping includes mission scheduling, satellite (including instrument) operations, satellite state-of-health trending, orbital analysis, and ground operations. The Product Generation (PG) functional grouping includes algorithm support, processed raw data, processing to level 1b (including calibration, navigation and registration), generation of the data for rebroadcast and for higher level data creation including operational derived products. The Product Distribution (PD) grouping includes distribution of level 1b (GOES full data set), GOES-Rebroadcast data (GRB), and derived products to user portals while addressing interfaces with the user for accessing GOES data. The user portals include the MM (for uplink of GRB	The document has 4 sections: the Introduction that overviews the mission and defines mission requirements, a Space and Launch Segment (section 2) and a Ground Segment (section 3) that consists of the following four functional groupings: 3.4) Mission Management (MM); 3.5) Product Generation (PG); 3.6) Product Distribution (PD); 3.7) NESDIS Infrastructure Interface and 4.0) User Interface Segment. Between each of the segments, there will be an interface. The details of each interface will be detailed in separate interface documents. The Space and Launch Segment includes the spacecraft, instruments, entire communications payload services located on the spacecraft, on-board processing systems, and launch vehicle. The Space and Launch Segment contains on-board processing systems include feeding the instrument data to the communications system and in parallel feeding the telemetry and command information to the communications system, calibration, and other functions. The Mission Management (MM) functional grouping includes mission scheduling, satellite (including instrument) operations, satellite state-of-health trending, orbital analysis, and ground operations. The Product Generation (PG) functional grouping includes algorithm support, processed raw data, processing to level 1b (including calibration, navigation and registration), generation of the data for rebroadcast and for higher level data creation including operational derived products. The Product Distribution (PD) grouping includes distribution of level 1b (GOES full data set), GOES rebroadcast data (GRB), and derived products to user portals while addressing interfaces with the user for accessing GOES data. The user portals include the MM (for uplink of GRB and/or

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	and/or GFUL), NOAA's National Weather Service (NWS), and other users. This section describes hardware, and supports requests from other NOAA line offices. The NESDIS Infrastructure Interface includes the Archive and Access functionality of the Comprehensive Large Array-data Stewardship System (CLASS) system and the implementation details under discussion for that system for storage and retrieval of GOES measurements. The User Education and Training Segment includes education and training plans for the users to facilitate usage of the larger, richer products sets available from the GOES-R series. Outreach to the general public is also discussed in this section.	GFUL), NOAA's National Weather Service (NWS), and other users. This section describes hardware, and supports requests from other NOAA line offices. The NESDIS Infrastructure Interface includes the Archive and Access functionality of the Comprehensive Large Array-data Stewardship System (CLASS) system and the implementation details under discussion for that system for storage and retrieval of GOES measurements. The User Interface Segment includes education and training plans for the users to facilitate usage of the larger, richer products sets available from the GOES-R series. Outreach to the general public is also discussed in this section.
6698	GOES-R General Interface Requirements Document (GIRD) 417-R-GIRD-0009 ABI Unique Instrument Interface Document (UIID) 417-R-ABIUIID-0010 HES Unique Instrument Interface Document (UIID) 417-R-HESUIID-0024 GLM Unique Instrument Interface Document (UIID) 417-R-GLMUIID-0058 SIS Unique Instrument Interface Document (UIID) 417-R-SISUIID-0034 SEISS Unique Instrument Interface Document (UIID) 417-R-SEISSUIID-0031 Security Requirements for Information Management Technology Resources (Oct 2003) CAR 1352.239-73 Security Processing Requirements for Contractor/Subcontractor Personnel for Accessing DOC Information Technology Systems (Oct 2003) The Radiation Environment for Electronic Devices on GOES-R	GOES-R General Interface Requirements Document (GIRD) 417-R-GIRD-0009 ABI Unique Instrument Interface Document (UIID) 417-R-ABIUIID-0010 HES Unique Instrument Interface Document (UIID) 417-R-HESUIID-0024 GLM Unique Instrument Interface Document (UIID) 417-R-GLMUIID-0058 SIS Unique Instrument Interface Document (UIID) 417-R-SISUIID-0034 SEISS Unique Instrument Interface Document (UIID) 417-R-SEISSUIID-0031 Consultative Committee for Space Data Systems (CCSDS) Recommendations Security Requirements for Information Management Technology Resources (Oct 2003) CAR 1352.239-73 Security Processing Requirements for Contractor/Subcontractor Personnel for Accessing DOC Information Technology Systems

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	CCDSD 202.1-B-3 *Telecommand Part 2.1-Command Operation Procedures*, Blue Book, Issue 2 CCDSD 301.0-B-3 *Time Code Formats*, Blue Book, Issue 3, January 2002 CCDSD 320.0-B-3 *CCSDS Global Spacecraft Identification Field Code Assignment Control Procedures*, Blue Book, Issue 3, April 2003 CCDSD 401.0-B-14 *Radio Frequency and Modulation Systems-Part 1: Earth Stations and Spacecraft*, Blue Book, Issue 14, December 2003 GOES-R Resource Allocation Document 417-R-RAD-0061	
6695	Additional Reference documents are listed below: Interface Requirements Document (IRD) for the GOES-R System: Space Segment to Ground Located - Command, Control, and Communications Segment (SS-C3S), 417-R-IRD-0001 Interface Requirements Document (IRD) for the GOES-R System: Space Segment to GOES-Rebroadcast (GRB) Service, 417-SeriesR-IRD-0002 Interface Requirements Document (IRD) for the GOES-R System: Space Segment to Low Rate Information Transmission (LRIT) Service, 417-SeriesR-IRD-0003 Interface Requirements Document (IRD) for the GOES-R System: Space Segment to Emergency Managers Weather Information Network (EMWIN) Service, 417-SeriesR-IRD-0004 Interface Requirements Document (IRD) for the GOES-R System: Space Segment to Data Collection System (DCS), 417-SeriesR-	Additional Reference documents are listed below: Interface Requirements Document (IRD) for the GOES-R System: Space Segment to Ground Located - Command, Control, and Communications Segment (SS-C3S), 417-R-IRD-0001 Interface Requirements Document (IRD) for the GOES-R System: Space Segment to GOES Rebroadcast (GRB) Service, 417-R-IRD-0002 Interface Requirements Document (IRD) for the GOES-R System: Space Segment to Low Rate Information Transmission (LRIT) Service, 417-R-IRD-0003 Interface Requirements Document (IRD) for the GOES-R System: Space Segment to Emergency Managers Weather Information Network (EMWIN) Service, 417-R-IRD-0004 Interface Requirements Document (IRD) for the GOES-R System: Space Segment to Data Collection System (DCS), 417-R-IRD-0005

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	IRD-0005 Interface Requirements Document (IRD) for the GOES-R System: Space Segment to Search and Rescue (SAR) Service, 417-SeriesR-IRD-0006 GOES-R Series Magnetometer Performance and Operational requirements Document (PORD), 417-SeriesR-MAGPORD-0038 MIL-A-83577B and NASA TP-1999-206988. General Environmental Verification Specification For STS & ELV Payload, Subsystems, and Components (GEVS-SE Rev A) “The NOAA Comprehensive Large Array-data Stewardship System (CLASS) Five-Year Plan, September, 2002.” SCOR Performance Operational Requirements Documents (PORD), Document 417-R-SCORPORD-00xx. SCOR Unique Instrument Interface Requirements Document (UIID) (417-R-SCORUIID-0041) ABI Mission Assurance Requirements (IMAR) 417-R-ABIMAR-0012 GOES-R Mission Assurance Requirements (MAR) 417-R-MAR-0011 GOES-R Series Concept of Operations Delta IV Payload Planners Guide (October 2000) Delta IV Payload Planners Guide Update (April 2002) Atlas Launch Systems Mission Planner's Guide, Revision 10, November 2004 CCSDS 0.0-O-1 Low Density Parity Check Codes Orange Book	Interface Requirements Document (IRD) for the GOES-R System: Space Segment to Search and Rescue (SAR) Service, 417-R-IRD-0006 GOES-R Series Magnetometer Performance and Operational requirements Document (PORD), 417-R-MAGPORD-0038 MIL-A-83577B and NASA TP-1999-206988. General Environmental Verification Specification For STS & ELV Payload, Subsystems, and Components (GEVS-SE Rev A) “The NOAA Comprehensive Large Array-data Stewardship System (CLASS) Five-Year Plan, September, 2002.” ABI Performance and Operational Requirements Documents (PORD), Document 417-R-ABIPORD-0017. HES Performance and Operational Requirements Documents (PORD), Document 417-R-HESPORD-0020. SIS Performance and Operational Requirements Documents (PORD), Document 417-R-SISPORD-0032. SEISS Performance and Operational Requirements Documents (PORD), Document 417-R-SEISSPORD-0030. GLM Performance Operational Requirements Documents (PORD), Document 417-R-GLMPORD-0057. SCOR Performance Operational Requirements Documents (PORD), Document 417-R-SCORPORD-00xx. SCOR IRD ABI Mission Assurance Requirements (IMAR) 417-R-ABIMAR-0012 GOES-R Mission Assurance Requirements (MAR) 417-R-MAR-0011 GOES-R Series Concept of Operations Delta IV Payload Planners Guide (October 2000) Delta IV Payload Planners Guide Update (April 2002) Atlas Launch Systems Mission Planner's Guide, Revision 10,

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		November 2004
6021	Program Overview United States Code Title 15 Chapter 9 has chartered Department of Commerce to forecast weather, issue storm warnings, and display weather and flood signals that will benefit agriculture, commerce, and navigation. National Oceanic and Atmospheric Administration's (NOAA's) primary environmental mission is to provide forecasts and warnings for the United States, its territories, adjacent waters and ocean area, for the protection of life and property and the enhancement of the national economy. To achieve this, multiple observation platforms have been developed and are used daily to derive products that are used in protecting estuaries farmlands, endangered species, maritime, air, and ground transportation systems, and property. One observational platform is the NOAA Space-based Observation System, which includes the GOES, Polar-orbiting Operational Environmental Satellites (POES), and the National Polar-orbiting Environmental Satellite System (NPOESS), providing forecasters with short and long term forecasts. The GOES satellites are stationary, located at 75° and 135° W (with potential for movement to 137° W) in GEO. GOES-R series satellites will provide capabilities for full disk imagery, with simultaneous (concurrent) Continental United States (CONUS) and Mesoscale environmental imagery and sounding coverage over a large portion of the full disk down to mesoscale regions. This information is used for short term forecasting (as well as longer term forecasting), whereas the POES and NPOESS	Program Overview United States Code Title 15 Chapter 9 has chartered Department of Commerce to forecast weather, issue storm warnings, and display weather and flood signals that will benefit agriculture, commerce, and navigation. National Oceanic and Atmospheric Administration's (NOAA) primary environmental mission is to provide forecasts and warnings for the United States, its territories, adjacent waters and ocean area, for the protection of life and property and the enhancement of the national economy. To achieve this, multiple observation platforms have been developed and are used daily to derive products that are used in protecting estuaries farmlands, endangered species, maritime, air, and ground transportation systems, and property. One observational platform is the NOAA Space-based Observation System, which includes the GOES, Polar-orbiting Operational Environmental Satellites (POES), and the National Polar-orbiting Environmental Satellite System (NPOESS), providing forecasters with short and long term forecast. The GOES satellites are stationary, located at 75° and 135° W (with potential for movement to 137° W) in GEO. GOES-R satellite will provide capabilities for full disk imagery, with simultaneous (concurrent) Continental United States (CONUS) and Mesoscale environmental imagery and sounding coverage over a large portion of the full disk down to mesoscale regions. This information is used for short term forecasting (as well as longer term forecasting), whereas, the POES and NPOESS satellites orbit

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	satellites orbit the earth in polar LEO orbit, with data revisit every ~4-6 hours in general, providing global observations leading to long term forecasts. NOAA's National Weather Service (NWS) uses information from both satellite systems to derive additional warning times in cases of major storms and severe events. The GOES satellites provide an uninterrupted flow of data processed through the ground infrastructure (end-to-end system) to forecasters in the NWS, other international, federal, state, and local governments, universities, and private organizations. These data are processed and assimilated into numerical forecast models that assist in forecasts ranging temporally from daily to extended forecasts, and to severe weather early watches and warnings. The GOES-R Ground System activity includes operations, monitoring, maintaining, acquiring, processing, distributing and storing data from GOES-R satellites. This includes: • Monitoring satellite health and safety; • Rapid collection, processing and analysis; • Scheduling satellite operations and data acquisition to meet GOES-R user needs; • Evaluating satellite systems performance; • Commanding the spacecraft; • Assessing satellite and ground station anomalies; • Data ingestion, product processing, and distribution of GOES-R data; • Receiving, compiling, archiving, and disseminating GOES-R data and products out through the GOES user service functionality. Planned GOES improvements in the GOES-R timeframe will cross cut NOAA’s four mission goals (ecosystems, weather and water, climate, and commerce and transportation). GOES-R	the earth in polar LEO orbit, with data revisit every ~4-6 hours in general, providing global observations leading to long term forecast. NOAA's National Weather Service (NWS) uses information derived from both satellite systems to derive additional warning times in cases of major storms and severe events. The GOES satellites provide an uninterrupted flow of data processed through the ground infrastructure (end-to-end system) to forecasters in the NWS, other international, federal, state, and local governments, universities, and private organizations. These data are processed and assimilated into numerical forecast models that assist in forecasts ranging temporally from daily to extended forecasts, and to severe weather early watches and warnings. The GOES-R System Mission Operations Center activity includes operations, monitoring, maintaining, acquiring, processing, distributing and storing data from GOES-R satellites. This includes: • Monitoring satellite health and safety; • Rapid collection, processing and analysis; • Scheduling satellite operations and data acquisition to meet GOES-R user needs; • Evaluating satellite systems performance; • Commanding the spacecraft; • Assessing satellite and ground station anomalies; • Data ingestion, product processing, and distribution of GOES-R data; • Receiving, compiling, archiving, and disseminating GOES-R data and products out through the GOES users interface. Planned GOES improvements in the GOES-R timeframe will cross cut NOAA’s four mission goals (ecosystems, weather and water, climate, and commerce and transportation). GOES-R

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	will also provide significant enhancement to (when compared to GOES-N products) NOAA’s ability to meet the short-term environmental sensing needs (improved weather event lead-times and more distinct affected areas) by an advancing instrument sensitivity to the detection of atmospheric moisture and improving the understanding of storm development of derived winds, which leads to a more dynamic numerical model performance accuracy. Synergized information will drive earlier predictions, more precise forecast, and precision area to be effected which will support a positive economic impact through dollar savings. GOES-R series acquisition consists of technology advancements in instruments and end-to-end infrastructure. These improvements will benefit the following: imaging and sounding of the atmosphere, sun, and ground environmental parameters; water (streams and rivers) level data collection through the Data Collection Platforms (DCP's); command, control and communications; product generation and distribution and reprocessing, and archive and access, up through the user interface. The GOES-R improvements solidly support NOAA’s mission, “to understand and predict changes in the Earth’s environment and conserve and manage coastal and marine resources to meet our Nation’s economic, social, and environmental needs.” The GOES-R system provides an observation system that produces reliable data on atmosphere, terrestrial, fresh water, and ocean ecosystems data and will be one of the primary U.S. systems networked into the Global Observing System led by the World Meteorological Organization and that was set as a goal at the Earth Observation Summit (July 2003).	will also provide significant enhancement to (when compared to GOES-N products) NOAA’s ability to meet the short-term environmental sensing needs (improved weather event lead-times and more distinct affected areas) by an advancing instrument sensitivity to the detection of atmospheric moisture and improving the understanding of storm development of derived winds, which leads to a more dynamic numerical model performance accuracy. Synergized information will drive earlier predictions, more precise forecast, and precision area to be effected which will support a positive economic impact through dollar savings. GOES-R series acquisition consists of technology advancements in instruments and end-to-end infrastructure. These improvements will benefit the following: imaging and sounding of the atmosphere, sun, and ground environmental parameters; water (streams and rivers) level data collection through the Data Collection Platforms (DCP's); command, control and communications; product generation and distribution and reprocessing, and archive and access, up through the user interface. The GOES-R improvements solidly support NOAA’s mission, “to understand and predict changes in the Earth’s environment and conserve and manage coastal and marine resources to meet our Nation’s economic, social, and environmental needs.” The GOES-R system provides an observation system that produces reliable data on atmosphere, terrestrial, fresh water, and ocean ecosystems data and will be one of the primary U.S. systems networked into the Global Observing System led by the World Meteorological Organization and that was set as a goal at the Earth Observation Summit (July 2003).

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326	**1.4.1 General Mission Overview**	1.4.1 General Mission Description
327	Discussion: By way of an overview, the GOES-R series mission has the following general characteristics. The satellites will make observations of the earth and its atmosphere geostationary orbit, be controlled from NOAA facilities, and transmit data to the ground stations. Products will be generated from the calibrated, registered, navigated data (level 1b data) on the ground and made available to the users. Some subset of that data will be rebroadcast to NOAA-defined users but all data (level 0) will be archived. Government-provided educational opportunities will be available for user training.	The GOES-R series mission shall have the following general characteristics that are detailed elsewhere in the document.
369	All segments shall support maintenance of operational interfaces with other applicable GOES-R Segments throughout the life of the programs.	All segments shall support maintenance of operational interfaces with other applicable GOES R Segments throughout the life of the programs.
366	The entire GOES-R system shall be validated and verified end-to-end. *Discussion: This includes validation of throughput (i.e., photons to products) from both product correctness and latency perspectives; validation of all autonomous processes; validation of all pre-launch, launch, on-orbit testing and operational procedures; validation of all tools used during end-to-end testing (such as simulations and emulations).*	The entire GOES-R system shall be validated and verified end-to-end. *Discussion:* This includes validation of throughput (i.e., photons to products) from both product correctness and latency perspectives; validation of all autonomous processes; validation of all pre-launch, launch, on-orbit testing and operational procedures; validation of all tools used during end-to-end testing (such as simulations and emulations).
363	Mission security shall be maintained for all segments. *Discussion: Mission security deals with satellite operations and transmission production, distribution, and archiving of the GOES-R data.*	Mission security shall be maintained for all segments. *Discussion:* Mission security deals with satellite operations and transmission production, distribution, and archiving of the GOES-R data.

ID	NOAA's Mission Requirements Document 2B (MRD-2B) for the GOES-R Series	Text On Jan27 (MRD-2B draft)
373	The configuration control of GOES-R hardware, software, databases, external interfaces, and interfaces between segments shall be maintained in accordance with the NOAA GOES-R System-level Configuration Management Plan (TBS).	The configuration control of GOES-R hardware, software, and databases, interfaces, and interfaces between segments shall be maintained in accordance with the NOAA GOES-R System-level Configuration Management Plan (TBS).
374	There shall be an end-to-end GOES-R Configuration Management Plan that describes a method for configuration control of hardware, software, databases, interfaces, and interfaces between segments.	There shall be an end-to-end GOES-R Configuration Management Plan that will describe a method for configuration control of hardware, software, databases, interfaces, and interfaces between segments.
6816	Definition: Mission availability is the probability that the entire GOES-R series system can be successfully used for its specified mission over the stated period of time and is defined as the Mean Time Between Failure (MTBF) divided by the sum of the MTBF and the Mean Time To Repair (MTTR) (nominally uptime divided by the sum of the uptime and downtime).	
329	The satellite constellation shall meet the mission availability.	The satellite constellation will meet the mission availability.
6020	The mission availability over the operational lifetime shall be 0.82 (TBR).	Definition: Mission availability is the probability that the entire GOES-R series system can be successfully used for its specified mission over the stated period of time and is defined as the Mean Time Between Failure (MTBF) divided by the sum of the MTBF and the Mean Time To Repair (MTTR) (nominally uptime divided by the sum of the uptime and downtime). The mission availability over the operational lifetime shall be 0.82 (TBR). The mission availability on a monthly basis shall be (TBD). The GOES-R series system shall support the data collection, downlink, and creation of GPRD critical user products over CONUS 0.98 of the time. The system shall support the data collection, downlink, and creation of other GPRD products as the

ID	NOAA's Mission Requirements Document 2B (MRD-2B) for the GOES-R Series	Text On Jan27 (MRD-2B draft)
		coverage of the system affords.
6817	The mission availability on a monthly basis shall be (TBD).	
6818	The GOES-R series system shall support the data collection, downlink, and creation of GPRD critical user products over CONUS 0.98 of the time.	
6819	The system shall support the data collection, downlink, and creation of other GPRD products as the coverage of the system affords.	
6773	The GOES-R system shall operate 24 hours per day and 7 days per week.	The capability to provide 24 hour a day and 7 days a week operational system shall be provided.
6486	Discussion: There will be many users for GOES-R data. There are prime users, which are portions of NOAA, who currently make algorithms and products for access, within the product latency, for their own users outside of NOAA. The product requirement of GOES-R listed in Section 1.4.7 were collected from groups inside NOAA who are responsible for reporting the needs of their respective users. Collectively both of these groups are called users.	There will be many users for GOES-R data. There are prime users, which are portions of NOAA, who currently make algorithms and products for access, within the product latency, for their own users outside of NOAA. The product requirement of GOES-R listed in Section 1.4.7 were collected from groups inside NOAA who are responsible for reporting the needs of their respective users. Collectively both of these groups are called users.
6487	Discussion: There are also two classes of data usage - operational and retrospective. Most users performing operational data usage requiring real-time data delivery for forecast and warning services will receive their GOES-R data directly from the PD Grouping or from the GRB. There are other users performing near-real-time operational processing who could query the GOES-R database to "pull" data in different temporal, spatial, or spectral forms depending on a particular immediate needs. The PD functionality will also support those working with GOES data in this way. The retrospective users will also query the GOES-R database to "pull" data in different temporal, spatial, or spectral forms depending on particular long-term needs. The AA functionality of the NESDIS	There are also two classes of data usage - operational and retrospective. Most users performing operational data usage requiring real-time data delivery for forecast and warning services will receive their GOES-R data directly from the PD Grouping or from the GRB. There are other users performing near-real-time operational who could query the GOES-R database to "pull" data in different temporal, spatial, or spectral forms depending on a particular immediate needs. The PD functionality will also support those working with GOES data in this way. The retrospective users will also query the GOES-R database to "pull" data in different temporal, spatial, or spectral forms depending on a particular long-term needs. The AA functionality of the NESDIS Infrastructure

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	Infrastructure Interface would continue to service the retrospective users as is done today.	Interface would continue to service the retrospective users as is done today.
382	Definition: Mission product data latency is product dependent and is the time from the data collected through the time that the data is converted to a specified GOES-R product (often beyond the level 1b) and delivered to the user portal. The latency varies by product. All mission product data latency values recorded in the latency table below shall be met for all GOES-R baseline products (namely, all non-P^{3}I products) generated from the GOES-R system. The T and O listed in the latency table note the Threshold and Goal values. A common data latency requirement is one minute (TBR) for some ABI products. The most restrictive data latencies in the GPRD-1 are 3 seconds, which applies to the solar X-ray flux, and 30 seconds, which applies for mesoscale (1000 km x 1000 km) cloud and moisture imagery. The 3 second latency requirements shall be divided across the multiple segments: (TBD) for the Space and Launch Segment, (TBD) for the Mission Management functionality of the Ground Segment and existing NOAA facilities including Space Environmental Center in NOAA, and (TBR) in total for product generation and for Product Distribution functionality of the Ground Segment. The one minute and the 30 second latency requirements shall be divided across the multiple segments in the following ways: for the	Definition: Mission product data latency is product dependent and is the time from the data collected through the time that the data is converted to a specified GOES-R product (often beyond the level 1b)and delivered to the user portal . The latency varies by product. All mission product data latency values recorded in the latency table below shall be met for all GOES-R baseline products generated from the GOES-R system. The T and O listed in the latency table note the Threshold and Goal values. A common data latency requirement is one minute (TBR) for some ABI products. The most restrictive data latencies in the GPRD-1 are 3 seconds, which applies to the solar X-ray flux, and 30 seconds, which applies for mesoscale (1000 km x 1000 km) cloud and moisture imagery. The 3 second latency requirements shall be divided across the multiple segments: (TBD) for the Space and Launch Segment, (TBD) for the Mission Management functionality of the Ground Segment and existing NOAA facilities including Space Environmental Center in NOAA, and (TBR) in total for product generation and for Product Distribution functionality of the Ground Segment. The one minute and the 30 second latency requirements shall be divided across the multiple segments in the following ways: for the 30 second requirement- (TBD) for the Space and Launch Segment;

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<tr><td></td><td>30 second requirement- (TBD) for the Space and Launch Segment; (TBD) for the Mission Management functionality; (TBD) for the Product Generation functionality, and (TBD) seconds for the Product Distribution functionality; and for the 1 minutes requirement- (TBD) seconds for the Space and Launch Segment, (TBD) for the Mission Management functionality of the Ground Segment, and (TBD) for the Product Generation functionality and (TBD) for the Product Distribution functionality.</td><td>(TBD) for the Mission Management functionality; (TBD) for the Product Generation functionality, and (TBD) seconds for the Product Distribution functionality; and for the 1 minutes requirement- (TBD) seconds for the Space and Launch Segment, (TBD) for the Mission Management functionality of the Ground Segment, and (TBD) for the Product Generation functionality and (TBD) for the Product Distribution functionality.</td></tr>
<tr><td>6786</td><td>
<table>
<tr><td>Observational Requirement</td><td>LEVEL</td><td>Data Latency</td></tr>
<tr><td><i>AEROSOLS</i></td><td></td><td></td></tr>
<tr><td>Aerosol Detection: CONUS (including Smoke and Dust)</td><td>T</td><td>15 min</td></tr>
<tr><td></td><td>O</td><td>3 min</td></tr>
<tr><td>Aerosol Detection: Hemispheric (including Smoke and Dust)</td><td>T</td><td>3 min</td></tr>
<tr><td></td><td>O</td><td>3 min</td></tr>
<tr><td>Aerosol Detection: Mesoscale (including Smoke and Dust)</td><td>T</td><td>15 min</td></tr>
<tr><td></td><td>O</td><td>15 min</td></tr>
<tr><td>Aerosol Particle Size</td><td>T</td><td>5 min</td></tr>
<tr><td></td><td>O</td><td>5 min</td></tr>
<tr><td>Dust/Aerosol: Loading: CONUS</td><td>T</td><td>3 min</td></tr>
<tr><td></td><td>O</td><td>3 min</td></tr>
<tr><td>Dust/Aerosol: Loading: Hemispheric</td><td>T</td><td>TBD</td></tr>
<tr><td></td><td>O</td><td>TBD</td></tr>
<tr><td>Suspended Matter / Optical Depth: CONUS</td><td>T</td><td>1 min</td></tr>
<tr><td></td><td>O</td><td>1 min</td></tr>
</table>
</td><td>
<table>
<tr><td>Observational Requirement</td><td>LEVEL</td><td>Data Latency</td></tr>
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<tr><td>Aerosol Detection: Hemispheric (including Smoke and Dust)</td><td>T</td><td>3 min</td></tr>
<tr><td></td><td>O</td><td>3 min</td></tr>
<tr><td>Aerosol Detection: Mesoscale (including Smoke and Dust)</td><td>T</td><td>15 min</td></tr>
<tr><td></td><td>O</td><td>15 min</td></tr>
<tr><td>Aerosol Particle Size</td><td>T</td><td>5 min</td></tr>
<tr><td></td><td>O</td><td>5 min</td></tr>
<tr><td>Dust/Aerosol: Loading: CONUS</td><td>T</td><td>3 min</td></tr>
<tr><td></td><td>O</td><td>3 min</td></tr>
<tr><td>Dust/Aerosol: Loading: Hemispheric</td><td>T</td><td>TBD</td></tr>
<tr><td></td><td>O</td><td>TBD</td></tr>
<tr><td>Suspended Matter: CONUS</td><td>T</td><td>1 min</td></tr>
<tr><td></td><td>O</td><td>1 min</td></tr>
<tr><td>Suspended Matter: Hemispheric</td><td>T</td><td>3 min</td></tr>
<tr><td></td><td>O</td><td>1 min</td></tr>
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	Suspended Matter / Optical Depth:: Hemispheric	T	3 min	Suspended Matter: Hemispheric	T	3 min
		O	1 min		O	1 min
	Volcanic Ash: Detection and Height	T	1 min	Volcanic Ash: Detection and Height	T	1 min
		O	30 sec		O	30 sec
	CLOUDS			*CLOUDS*		
	Aircraft Icing Threat	T	15 min	Aircraft Icing Threat	T	15 min
		O	5 min		O	5 min
	Cloud Base Height: CONUS	T	1 min	Cloud Base Height: CONUS	T	1 min
		O	1 min		O	1 min
	Cloud Base Height: Hemispheric	T	1 min	Cloud Base Height: Hemispheric	T	1 min
		O	1 min		O	1 min
	Cloud Base Height: Mesoscale	T	1 min	Cloud Base Height: Mesoscale	T	1 min
		O	1 min		O	1 min
	Cloud Ice Water Path: CONUS	T	1 min	Cloud Ice Water Path: CONUS	T	1 min
		O	1 min		O	1 min
	Cloud Ice Water Path: Hemispheric	T	1 min	Cloud Ice Water Path: Hemispheric	T	1 min
		O	1 min		O	1 min
	Cloud Ice Water Path: Mesoscale	T	1 min	Cloud Ice Water Path: Mesoscale	T	1 min
		O	1 min		O	1 min
	Cloud Imagery: Coastal	T	15 min	Cloud Imagery: Coastal	T	15 min
		O	15 min		O	15 min
	Cloud Layers/ Heights and Thickness: CONUS	T	15 min	Cloud Layers/ Heights and Thickness: CONUS	T	15 min
		O	1 min		O	1 min
	Cloud Layers/ Heights and Thickness: Hemispheric	T	15 min	Cloud Layers/ Heights and Thickness: Hemispheric	T	15 min
		O	10 min		O	10 min
				Cloud Layers/ Heights and Thickness: Mesoscale	T	10 min
					O	10 min

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<tr><td></td><td>
<table>
<tr><td>Cloud Layers/ Heights and Thickness: Mesoscale</td><td>T</td><td>10 min</td></tr>
<tr><td></td><td>O</td><td>10 min</td></tr>
<tr><td>Cloud Liquid Water: CONUS</td><td>T</td><td>15 min</td></tr>
<tr><td></td><td>O</td><td>1 min</td></tr>
<tr><td>Cloud Liquid Water: Hemispheric</td><td>T</td><td>1 min</td></tr>
<tr><td></td><td>O</td><td>1 min</td></tr>
<tr><td>Cloud Liquid Water: Mesoscale</td><td>T</td><td>15 min</td></tr>
<tr><td></td><td>O</td><td>15 min</td></tr>
<tr><td>Cloud & Moisture Imagery: CONUS</td><td>T</td><td>1 min</td></tr>
<tr><td></td><td>O</td><td>1 min</td></tr>
<tr><td>Cloud & Moisture Imagery: Hemispheric</td><td>T</td><td>1 min</td></tr>
<tr><td></td><td>O</td><td>1 min</td></tr>
<tr><td>Cloud & Moisture Imagery: Mesoscale</td><td>T</td><td>30 sec</td></tr>
<tr><td></td><td>O</td><td>TBD</td></tr>
<tr><td>Cloud Optical Depth: CONUS</td><td>T</td><td>15 min</td></tr>
<tr><td></td><td>O</td><td>1 min</td></tr>
<tr><td>Cloud Optical Depth: Hemispheric</td><td>T</td><td>1 min</td></tr>
<tr><td></td><td>O</td><td>1 min</td></tr>
<tr><td>Cloud Particle Size Distribution: CONUS</td><td>T</td><td>1 min</td></tr>
<tr><td></td><td>O</td><td>1 min</td></tr>
<tr><td>Cloud Particle Size Distribution: Hemispheric</td><td>T</td><td>1 min</td></tr>
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<tr><td>Cloud Liquid Water: CONUS</td><td>T</td><td>15 min</td></tr>
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<tr><td>Cloud Liquid Water: Mesoscale</td><td>T</td><td>15 min</td></tr>
<tr><td></td><td>O</td><td>15 min</td></tr>
<tr><td>Cloud & Moisture Imagery: CONUS</td><td>T</td><td>1 min</td></tr>
<tr><td></td><td>O</td><td>1 min</td></tr>
<tr><td>Cloud & Moisture Imagery: Hemispheric</td><td>T</td><td>1 min</td></tr>
<tr><td></td><td>O</td><td>1 min</td></tr>
<tr><td>Cloud & Moisture Imagery: Mesoscale</td><td>T</td><td>30 sec</td></tr>
<tr><td></td><td>O</td><td>TBD</td></tr>
<tr><td>Cloud Optical Depth: CONUS</td><td>T</td><td>15 min</td></tr>
<tr><td></td><td>O</td><td>1 min</td></tr>
<tr><td>Cloud Optical Depth: Hemispheric</td><td>T</td><td>1 min</td></tr>
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<tr><td>Cloud Particle Size Distribution: Mesoscale</td><td>T</td><td>1 min</td></tr>
<tr><td></td><td>O</td><td>1 min</td></tr>
<tr><td>Cloud Top Phase: CONUS</td><td>T</td><td>1 min</td></tr>
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ID	NOAA's Mission Requirements Document 2B (MRD-2B) for the GOES-R Series			Text On Jan27 (MRD-2B draft)		
	Cloud Particle Size Distribution: Mesoscale	T	1 min		O	1 min
		O	1 min	Cloud Top Height: CONUS	T	3 min
	Cloud Top Phase: CONUS	T	1 min		O	1 min
		O	1 min	Cloud Top Height: Hemispheric	T	3 min
	Cloud Top Phase: Hemispheric	T	1 min		O	1 min
		O	1 min	Cloud Top Height: Mesoscale	T	15 min
	Cloud Top Phase: Mesoscale	T	1 min		O	15 min
		O	1 min	Cloud Top Pressure: CONUS	T	10 min
	Cloud Top Height: CONUS	T	3 min		O	1 min
		O	1 min	Cloud Top Pressure: Hemispheric	T	3 min
	Cloud Top Height: Hemispheric	T	3 min		O	1 min
		O	1 min	Cloud Top Temperature: Hemispheric	T	1 min
	Cloud Top Height: Mesoscale	T	15 min		O	1 min
		O	15 min	Cloud Top Temperature: Mesoscale	T	5 min
	Cloud Top Pressure: CONUS	T	10 min		O	5 min
		O	1 min	Cloud Type: CONUS	T	10 min
	Cloud Top Pressure: Hemispheric	T	3 min		O	1 min
		O	1 min	Cloud Type: Hemispheric	T	1 min
	Cloud Top Temperature: Hemispheric	T	1 min		O	1 min
		O	1 min	Cloud Type: Mesoscale	T	TBD
	Cloud Top Temperature: Mesoscale	T	5 min		O	1 min
		O	5 min	Convective Initiation	T	3 min
	Cloud Type: CONUS	T	10 min		O	1 min
		O	1 min	Enhanced "V"/Overshooting Top Detection: CONUS	T	5 min
	Cloud Type: Hemispheric	T	1 min		O	30 sec
		O	1 min	Enhanced "V"/Overshooting Top Detection: Mesoscale	T	5 min
	Cloud Type: Mesoscale	T	TBD		O	5 min
				Hurricane Intensity	T	1 min

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<tr><td>Convective Initiation</td><td>T</td><td>3 min</td></tr>
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<tr><td></td><td>O</td><td>30 sec</td></tr>
<tr><td>Enhanced "V"/Overshooting Top Detection: Mesoscale</td><td>T</td><td>5 min</td></tr>
<tr><td></td><td>O</td><td>5 min</td></tr>
<tr><td>Hurricane Intensity</td><td>T</td><td>1 min</td></tr>
<tr><td></td><td>O</td><td>1 min</td></tr>
<tr><td>Imagery: All-Weather/Day-Night: Hemispheric</td><td>T</td><td>TBD</td></tr>
<tr><td></td><td>O</td><td>15 min</td></tr>
<tr><td>Lightning Detection: CONUS</td><td>T</td><td>1 min</td></tr>
<tr><td></td><td>O</td><td><10 sec</td></tr>
<tr><td>Lightning Detection: Hemispheric</td><td>T</td><td>1 min</td></tr>
<tr><td></td><td>O</td><td><10 sec</td></tr>
<tr><td>Lightning Detection: Mesoscale</td><td>T</td><td>1 min</td></tr>
<tr><td></td><td>O</td><td><10 sec</td></tr>
<tr><td>Low Cloud and Fog</td><td>T</td><td>1 min</td></tr>
<tr><td></td><td>O</td><td>1 min</td></tr>
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<tr><td></td><td>O</td><td>1 min</td></tr>
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<tr><td></td><td>O</td><td>5 min</td></tr>
<tr><td>Visibility: Coastal</td><td>T</td><td>15 min</td></tr>
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<tr><td></td><td>O</td><td><10 sec</td></tr>
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<tr><td></td><td>O</td><td>15 min</td></tr>
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<tr><td>Rainfall Potential</td><td>T</td><td>5 min</td></tr>
<tr><td></td><td>O</td><td>3 min</td></tr>
<tr><td>Rainfall Rate/QPE</td><td>T</td><td>1 min</td></tr>
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<tr><td></td><td>O</td><td>3 min</td></tr>
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<tr><td></td><td>O</td><td>1 min</td></tr>
<tr><td>Atmospheric Vertical Moisture Profile: Hemispheric</td><td>T</td><td>3 min</td></tr>
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<tr><td>Derived Stability Indices: CONUS</td><td>T</td><td>3 min</td></tr>
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<tr><td></td><td>O</td><td>15 min</td></tr>
<tr><td>Moisture Flux: CONUS</td><td>T</td><td>3 min</td></tr>
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ID	NOAA's Mission Requirements Document 2B (MRD-2B) for the GOES-R Series			Text On Jan27 (MRD-2B draft)		
	Mesoscale				O	1 min
		O	3 min	Pressure Profile: Mesoscale	T	TBD
	Derived Stability Indices: CONUS	T	3 min		O	10 min
		O	1 min	Total Precipitable Water: Hemispheric	T	TBD
	Derived Stability Indices: Mesoscale	T	15 min		O	TBD
		O	15 min	Total Water Content: CONUS	T	3 min
	Moisture Flux: CONUS	T	3 min		O	1 min
		O	1 min	Total Water Content: Hemispheric	T	3 min
	Moisture Flux: Hemispheric	T	3 min		O	1 min
		O	1 min	Total Water Content: Mesoscale	T	5 min
	Moisture Flux: Mesoscale	T	3 min		O	5 min
		O	1 min	RADIANCES		
	Pressure Profile: Mesoscale	T	TBD	Clear Sky Masks: CONUS	T	15 min
		O	10 min		O	TBD
	Total Precipitable Water: Hemispheric	T	TBD	Clear Sky Masks: Hemispheric	T	15 min
		O	TBD		O	TBD
	Total Water Content: CONUS	T	3 min	Clear Sky Masks: Mesoscale	T	5 min
		O	1 min		O	5 min
	Total Water Content: Hemispheric	T	3 min	Radiances: CONUS	T	10 min
		O	1 min		O	1 min
	Total Water Content: Mesoscale	T	5 min	Radiances: Hemispheric	T	60 min
		O	5 min		O	15 min
	RADIANCES			Radiances: Mesoscale	T	30 min
	Clear Sky Masks: CONUS	T	15 min		O	5 min
		O	TBD	RADIATION		
	Clear Sky Masks: Hemispheric	T	15 min	Absorbed Shortwave Radiation: Surface/ Mesoscale	T	60 min
					O	5 min
				Downward Longwave Radiation: Surface/CONUS	T	60 min

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<tr><td>RADIATION</td><td></td><td></td></tr>
<tr><td>Absorbed Shortwave Radiation: Surface/ Mesoscale</td><td>T</td><td>60 min</td></tr>
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<tr><td>CO Concentration</td><td>T</td><td>TBD</td></tr>
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<tr><td>WINDS</td><td></td><td></td></tr>
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<tr><th>ID</th><th>NOAA’s Mission Requirements Document 2B (MRD-2B) for the GOES-R Series</th><th>Text On Jan27 (MRD-2B draft)</th></tr>
<tr><td></td><td>
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<tr><td>Derived Motion Winds: CONUS</td><td>T</td><td>3 min</td></tr>
<tr><td></td><td>O</td><td>1 min</td></tr>
<tr><td>Derived Motion Winds: Hemispheric</td><td>T</td><td>3 min</td></tr>
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<tr><td>Derived Motion Winds: Mesoscale</td><td>T</td><td>3 min</td></tr>
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<tr><td>Microburst Windspeed Potential</td><td>T</td><td>3 min</td></tr>
<tr><td></td><td>O</td><td>1 min</td></tr>
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</td><td></td></tr>
<tr><td>391</td><td>The GPRD-1 products, as they exist at the time of writing the MRD-2B, that shall be met by the GOES-R series are listed below. The GOES-R system will produce these products; further details on the products parameters are defined elsewhere in the document. The product requirements are recorded for traceability here and are also listed in the appendix to this document.
From geostationary orbit, a full disk view can be achieved and is defined as a 17.76 degree diameter circle centered at nadir above the equator. Full disk view from satellites in more than one orbital slot can provide coverage of the Western Hemisphere. Because the product names are inputs to the MRD from the PRD, the user supplied product name has been used. Thus the user supplied term Hemispheric is met by the ABI data from full disk views of the earth (out to the earth's limb for some products including qualitative cloud drift winds from imagery and out to about 70 degree local zenith angle (LZA) for more quantitative product) and is addressed by HES out to 62 degree LZA for retrievals (or slightly beyond as radiative transfer models improve). Users are aware that full disk data will be produced from the ABI and that HES data required outside of the 62 degree LZA may require longer than 1 hour to collect at the coverage rate</td><td>The GPRD-1 products, as they exist at the time of writing the MRD-2B, that shall be met by the GOES-R series are listed below. The GOES-R system will produce these products; further details on the products are defined elsewhere in the document. The GPRD-1 product requirements are recorded for traceability and are listed in the appendix to this document.
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<tr><td></td><td>of 62 degree LZA/hour. For emphasis the usage of hemispheric in quotes is often applied when the primary instrument for the product is HES.</td><td></td></tr>
<tr><td>394</td><td>1.4.7.1 GPRD-1 Atmosphere</td><td>1.4.7.1 GPRD-1fd Atmosphere</td></tr>
<tr><td>418</td><td>Suspended Matter / Optical Depth: CONUS</td><td>Suspended Matter: CONUS</td></tr>
<tr><td>421</td><td>Suspended Matter / Optical Depth:: “Hemispheric”</td><td>Suspended Matter: “Hemispheric”</td></tr>
<tr><td>6790</td><td>1.4.8 Mission Product Ranges and Accuracies</td><td>1.4.10 Mission Product Ranges and Accuracies</td></tr>
<tr><td>6791</td><td>The mission product ranges included in the four product range tables below shall be met by the GOES-R system. The T and O listed in the table note the Threshold and Goal values.</td><td>The mission product ranges included in the four product range tables below shall be met by the GOES-R system. The T and O listed in the latency table note the Threshold and Goal values.</td></tr>
<tr><td>6793</td><td>
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<tr><th>Observational Requirement</th><th>LEVEL</th><th>Product Meas. Range</th></tr>
<tr><td><i>AEROSOLS</i></td><td></td><td></td></tr>
<tr><td>Aerosol Detection: CONUS (including Smoke and Dust)</td><td>T</td><td>Binary yes/no detection</td></tr>
<tr><td></td><td>O</td><td>Binary yes/no detection</td></tr>
<tr><td>Aerosol Detection: Hemispheric (including Smoke and Dust)</td><td>T</td><td>Binary yes/no detection</td></tr>
<tr><td></td><td>O</td><td>Binary yes/no detection</td></tr>
<tr><td>Aerosol Detection: Mesoscale (including Smoke and Dust)</td><td>T</td><td>Binary yes/no detection</td></tr>
<tr><td></td><td>O</td><td>Binary yes/no</td></tr>
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<tr><td></td><td></td><td>detection</td></tr>
<tr><td>Aerosol Particle Size</td><td>T</td><td>TBD</td></tr>
<tr><td></td><td>O</td><td>TBD</td></tr>
<tr><td>Dust/Aerosol: Loading: CONUS</td><td>T</td><td>Light/ Mod/ Heavy</td></tr>
<tr><td></td><td>O</td><td>TBD</td></tr>
<tr><td>Dust/Aerosol: Loading: Hemispheric</td><td>T</td><td>Light/ Mod/ Heavy</td></tr>
<tr><td></td><td>O</td><td>TBD</td></tr>
<tr><td>Suspended Matter / Optical Depth: CONUS</td><td>T</td><td>0.0 - 3.0</td></tr>
<tr><td></td><td>O</td><td>0.0 - 3.0</td></tr>
<tr><td>Suspended Matter / Optical Depth: Hemispheric</td><td>T</td><td>0.0 - 3.0</td></tr>
<tr><td></td><td>O</td><td>0.0 - 3.0</td></tr>
<tr><td>Volcanic Ash: Detection and Height</td><td>T</td><td>0-50 tons/km^2</td></tr>
<tr><td></td><td>O</td><td>0-50 tons/km^2 (1 ton = 1000 kg)</td></tr>
<tr><td><i>CLOUDS</i></td><td></td><td></td></tr>
<tr><td>Aircraft Icing Threat</td><td>T</td><td>None - Hvy</td></tr>
<tr><td></td><td>O</td><td>None - Hvy</td></tr>
<tr><td>Cloud Base Height: CONUS</td><td>T</td><td>0 - TBD km</td></tr>
<tr><td></td><td>O</td><td>0 - TBD km</td></tr>
<tr><td>Cloud Base Height: Hemispheric</td><td>T</td><td>0 - TBD km</td></tr>
<tr><td></td><td>O</td><td>0 - 30 km</td></tr>
<tr><td>Cloud Base Height: Mesoscale</td><td>T</td><td>0 - TBD km</td></tr>
<tr><td></td><td>O</td><td>0 - 1 km</td></tr>
<tr><td>Cloud Ice Water Path: CONUS</td><td>T</td><td>0-1 mm (Day) 0-0.2 mm (Night)</td></tr>
<tr><td></td><td>O</td><td>0-1 mm (Day) 0-</td></tr>
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<tr><td></td><td></td><td>detection</td></tr>
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<tr><td>Dust/Aerosol: Loading: Hemispheric</td><td>T</td><td>Light/ Mod/ Heavy</td></tr>
<tr><td></td><td>O</td><td>TBD</td></tr>
<tr><td>Suspended Matter: CONUS</td><td>T</td><td>TBD</td></tr>
<tr><td></td><td>O</td><td>TBD</td></tr>
<tr><td>Suspended Matter: Hemispheric</td><td>T</td><td>TBD</td></tr>
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<tr><td>Cloud Base Height: CONUS</td><td>T</td><td>0 - TBD km</td></tr>
<tr><td></td><td>O</td><td>0 - TBD km</td></tr>
<tr><td>Cloud Base Height: Hemispheric</td><td>T</td><td>0 - TBD km</td></tr>
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<tr><td>Cloud Base Height: Mesoscale</td><td>T</td><td>0 - TBD km</td></tr>
<tr><td></td><td>O</td><td>0 - 1 km</td></tr>
<tr><td>Cloud Ice Water Path: CONUS</td><td>T</td><td>0-1 mm (Day) 0-0.2 mm (Night)</td></tr>
<tr><td></td><td>O</td><td>0-1 mm (Day) 0-</td></tr>
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ID	**NOAA's Mission Requirements Document 2B (MRD-2B) for the GOES-R Series**			**Text On Jan27 (MRD-2B draft)**		
			0.2 mm (Night)			0.2 mm (Night)
	Cloud Ice Water Path: Hemispheric	T	0-1 mm (Day) 0-0.2 mm (Night)	Cloud Ice Water Path: Hemispheric	T	0-1 mm (Day) 0-0.2 mm (Night)
		O	0-1 mm (Day) 0-0.2 mm (Night)		O	0-1 mm (Day) 0-0.2 mm (Night)
	Cloud Ice Water Path: Mesoscale	T	0 - 2 mm (Day) 0 - 0.2 mm (Night)	Cloud Ice Water Path: Mesoscale	T	0 - 2 mm (Day) 0 - 0.2 mm (Night)
		O	0 - 2 mm (Day) 0 - 0.2 mm (Night)		O	0 - 2 mm (Day) 0 - 0.2 mm (Night)
	Cloud Imagery: Coastal	T	TBD	Cloud Imagery: Coastal	T	TBD
		O	TBD		O	TBD
	Cloud Layers/ Heights and Thickness: CONUS	T	Thickness: only by general cloud type. Heights of up to 5 layers	Cloud Layers/ Heights and Thickness: CONUS	T	Thickness: only by general cloud type. Heights of up to 5 layers
		O	Thickness: only by general cloud type. Heights of up to 5 layers		O	Thickness: only by general cloud type. Heights of up to 5 layers
	Cloud Layers/ Heights and Thickness: Hemispheric	T	Thickness: only by general cloud type. Heights of up to 5 layers	Cloud Layers/ Heights and Thickness: Hemispheric	T	Thickness: only by general cloud type. Heights of up to 5 layers
		O	0 - 20 km		O	0 - 20 km
	Cloud Layers/ Heights and Thickness: Mesoscale	T	Thickness: only by general cloud type. Heights of up to 5 layers	Cloud Layers/ Heights and Thickness: Mesoscale	T	Thickness: only by general cloud type. Heights of up to 5 layers
		O	0 - 20 km		O	0 - 20 km
	Cloud Liquid Water: CONUS	T	0 - 2 mm	Cloud Liquid Water: CONUS	T	0 - 2 mm

ID	NOAA’s Mission Requirements Document 2B (MRD-2B) for the GOES-R Series			Text On Jan27 (MRD-2B draft)		
		O	0 - 2 mm		O	0 - 2 mm
	Cloud Liquid Water: Hemispheric	T	0 - 1 mm	Cloud Liquid Water: Hemispheric	T	0 - 1 mm
		O	0 - 2 mm		O	0 - 2 mm
	Cloud Liquid Water: Mesoscale	T	0 - 1 mm	Cloud Liquid Water: Mesoscale	T	0 - 1 mm
		O	0 - 2 mm		O	0 - 2 mm
	Cloud & Moisture Imagery: CONUS	T	n/a	Cloud & Moisture Imagery: CONUS	T	n/a
		O	n/a		O	n/a
	Cloud & Moisture Imagery: Hemispheric	T	n/a	Cloud & Moisture Imagery: Hemispheric	T	n/a
		O	n/a		O	n/a
	Cloud & Moisture Imagery: Mesoscale	T	n/a	Cloud & Moisture Imagery: Mesoscale	T	n/a
		O	n/a		O	n/a
	Cloud Optical Depth: CONUS	T	0.5 - 50	Cloud Optical Depth: CONUS	T	0.5 - 50
		O	0 - 100		O	0 - 100
	Cloud Optical Depth: Hemispheric	T	0.5 - 50	Cloud Optical Depth: Hemispheric	T	0.5 - 50
		O	0.01 - 100		O	0.01 - 100
	Cloud Particle Size Distribution: CONUS	T	0 - 50 µm	Cloud Particle Size Distribution: CONUS	T	0 - 50 µm
		O	0 - 1000 µm		O	0 - 1000 µm
	Cloud Particle Size Distribution: Hemispheric	T	0 - 50 µm	Cloud Particle Size Distribution: Hemispheric	T	0 - 50 µm
		O	0 - 1000 µm		O	0 - 1000 µm
	Cloud Particle Size Distribution: Mesoscale	T	0 - 50 µm	Cloud Particle Size Distribution: Mesoscale	T	0 - 50 µm
		O	0 - 1000 µm		O	0 - 1000 µm
	Cloud Top Phase: CONUS	T	liquid/solid/ supercooled/ mixed	Cloud Top Phase: CONUS	T	liquid/solid/ supercooled/ mixed

ID	NOAA’s Mission Requirements Document 2B (MRD-2B) for the GOES-R Series			Text On Jan27 (MRD-2B draft)		
		O	TBD		O	TBD
	Cloud Top Phase: Hemispheric	T	liquid/solid/ supercooled/ mixed	Cloud Top Phase: Hemispheric	T	liquid/solid/ supercooled/ mixed
		O	TBD		O	TBD
	Cloud Top Phase: Mesoscale	T	liquid/solid/ supercooled/ mixed	Cloud Top Phase: Mesoscale	T	liquid/solid/ supercooled/ mixed
		O	TBD		O	TBD
	Cloud Top Height: CONUS	T	100m - 300hPa	Cloud Top Height: CONUS	T	100m - 300hPa
		O	100m - 100hPa		O	100m - 100hPa
	Cloud Top Height: Hemispheric	T	0-15 km	Cloud Top Height: Hemispheric	T	0-15 km
		O	0-25 km		O	0-25 km
	Cloud Top Height: Mesoscale	T	0-20 km	Cloud Top Height: Mesoscale	T	0-20 km
		O	0-20 km		O	0-20 km
	Cloud Top Pressure: CONUS	T	100m-300hPa	Cloud Top Pressure: CONUS	T	100m-300hPa
		O	100m-100hPa		O	100m-100hPa
	Cloud Top Pressure: Hemispheric	T	TBD	Cloud Top Pressure: Hemispheric	T	TBD
		O	TBD		O	TBD
	Cloud Top Temperature: Hemispheric	T	180-300 K	Cloud Top Temperature: Hemispheric	T	180-300 K
		O	170-310 K		O	170-310 K
	Cloud Top Temperature: Mesoscale	T	180-300 K	Cloud Top Temperature: Mesoscale	T	180-300 K
		O	190-300 K		O	190-300 K
	Cloud Type: CONUS	T	7 types	Cloud Type: CONUS	T	7 types
		O	20 types		O	20 types
	Cloud Type: Hemispheric	T	7 types	Cloud Type: Hemispheric	T	7 types
		O	20 types		O	20 types
	Cloud Type: Mesoscale	T	7 types	Cloud Type: Mesoscale	T	7 types

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		O	20 types		O	20 types
	Convective Initiation	T	TBD	Convective Initiation	T	TBD
		O	TBD		O	TBD
	Enhanced "V"/Overshooting Top Detection: CONUS	T	0 - 1 Binary (160 - 270 K)	Enhanced "V"/Overshooting Top Detection: CONUS	T	0 - 1 Binary (160 - 270 K)
		O	0 - 1 Binary (160 - 270 K Top)		O	0 - 1 Binary (160 - 270 K Top)
	Enhanced "V"/Overshooting Top Detection: Mesoscale	T	0 - 1 Binary detection (160-270 K)	Enhanced "V"/Overshooting Top Detection: Mesoscale	T	0 - 1 Binary detection (160-270 K)
		O	0-1		O	0-1
	Hurricane Intensity	T	TBD	Hurricane Intensity	T	TBD
		O	TBD		O	TBD
	Imagery: All Weather/Day-Night: Hemispheric	T	TBD	Imagery: All Weather/Day-Night: Hemispheric	T	TBD
		O	TBD		O	TBD
	Lightning Detection: CONUS	T	Real time	Lightning Detection: CONUS	T	Real time
		O	Real time		O	Real time
	Lightning Detection: Hemispheric	T	Real time	Lightning Detection: Hemispheric	T	Real time
		O	Real time		O	Real time
	Lightning Detection: Mesoscale	T	Real time	Lightning Detection: Mesoscale	T	Real time
		O	Real time		O	Real time
	Low Cloud and Fog	T	Fog/No Fog	Low Cloud and Fog	T	Fog/No Fog
		O	Fog/No Fog		O	Fog/No Fog
	Turbulence: Hemispheric	T	Binary moderate or greater (over 100 m - 4 km)	Turbulence: Hemispheric	T	Binary moderate or greater (over 100 m - 4 km)
		O	None thru Severe (none, light, moderate, severe)		O	None thru Severe (none, light, moderate, severe)

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	Turbulence: Mesoscale	T	Binary moderate or greater (over 100 m - 4 km)	Turbulence: Mesoscale	T	Binary moderate or greater (over 100 m - 4 km)
		O	TBD		O	TBD
	Visibility: Coastal	T	0 - 3.2 km	Visibility: Coastal	T	0 - 3.2 km
		O	0 - 16 km		O	0 - 16 km
	Visibility: Hemispheric	T	0-30 km	Visibility: Hemispheric	T	0-30 km
		O	0-30 km		O	0-30 km
	PRECIPITATION			*PRECIPITATION*		
	Probability of Rainfall	T	0 to 100%	Probability of Rainfall	T	0 to 100%
		O	0 to 100%		O	0 to 100%
	Rainfall Potential	T	0-100 mm/hr	Rainfall Potential	T	0-100 mm/hr
		O	0-100 mm/hr		O	0-100 mm/hr
	Rainfall Rate/QPE	T	0-100 mm/hr	Rainfall Rate/QPE	T	0-100 mm/hr
		O	0-100 mm/hr		O	0-100 mm/hr
	PROFILES			PROFILES		
	Atmospheric Vertical Moisture Profile: CONUS	T	0 - 100 %	Atmospheric Vertical Moisture Profile: CONUS	T	0 - 100 %
		O	0 - 100 %		O	0 - 100 %
	Atmospheric Vertical Moisture Profile: Hemispheric	T	0 - 100 %	Atmospheric Vertical Moisture Profile: Hemispheric	T	0 - 100 %
		O	0 - 100 %		O	0 - 100 %
	Atmospheric Vertical Moisture Profile: Mesoscale	T	0 - 100 %	Atmospheric Vertical Moisture Profile: Mesoscale	T	0 - 100 %
		O	0 - 100 %		O	0 - 100 %
	Atmospheric Vertical Temperature Profile: CONUS	T	180-320 K	Atmospheric Vertical Temperature Profile: CONUS	T	180-320 K
		O	180-320 K		O	180-320 K
	Atmospheric Vertical Temperature Profile: Hemispheric	T	180-320 K	Atmospheric Vertical Temperature Profile: Hemispheric	T	180-320 K

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		O	175-325 K		O	175-325 K
	Atmospheric Vertical Temperature Profile: Mesoscale	T	180-320 K	Atmospheric Vertical Temperature Profile: Mesoscale	T	180-320 K
		O	180-320 K		O	180-320 K
	Capping Inversion Information: CONUS	T	T: 210-300K Td: 210-300K Hgt: Sfc-650 mb	Capping Inversion Information: CONUS	T	T: 210-300K Td: 210-300K Hgt: Sfc-650 mb
		O	T: 210-300K Td: 210-300K Hgt: Sfc-650 mb		O	T: 210-300K Td: 210-300K Hgt: Sfc-650 mb
	Capping Inversion Information: Mesoscale	T	0-20 k (delta T & Td)	Capping Inversion Information: Mesoscale	T	0-20 k (delta T & Td)
		O	0-20 k (delta T & Td)		O	0-20 k (delta T & Td)
	Derived Stability Indices: CONUS	T	TBD	Derived Stability Indices: CONUS	T	TBD
		O	TBD		O	TBD
	Derived Stability Indices: Mesoscale	T	0-5000 J/kg	Derived Stability Indices: Mesoscale	T	0-5000 J/kg
		O	0-5000 J/kg		O	0-5000 J/kg
	Moisture Flux: CONUS	T	0 - 20 g/kg/h	Moisture Flux: CONUS	T	0 - 20 g/kg/h
		O	0 - 20 g/kg/h		O	0 - 20 g/kg/h
	Moisture Flux: Hemispheric	T	0 - 20 g/kg/h	Moisture Flux: Hemispheric	T	0 - 20 g/kg/h
		O	0 - 20 g/kg/h		O	0 - 20 g/kg/h
	Moisture Flux: Mesoscale	T	0 - 20 g/kg/h	Moisture Flux: Mesoscale	T	0 - 20 g/kg/h
		O	0 - 20 g/kg/h		O	0 - 20 g/kg/h
	Pressure Profile: Mesoscale	T	TBD	Pressure Profile: Mesoscale	T	TBD
		O	10-1030 mb		O	10-1030 mb
	Total Precipitable Water: Hemispheric	T	TBD	Total Precipitable Water: Hemispheric	T	TBD
		O	TBD		O	TBD

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	Total Water Content: CONUS	T	0 - 100 mm	Total Water Content: CONUS	T	0 - 100 mm
		O	0 - 100 mm		O	0 - 100 mm
	Total Water Content: Hemispheric	T	0 - 100 mm	Total Water Content: Hemispheric	T	0 - 100 mm
		O	0 - 100 mm		O	0 - 100 mm
	Total Water Content: Mesoscale	T	0-100 mm	Total Water Content: Mesoscale	T	0-100 mm
		O	0-100 mm		O	0-100 mm
	RADIANCES			RADIANCES		
	Clear Sky Masks: CONUS	T	0 - 1 Binary	Clear Sky Masks: CONUS	T	0 - 1 Binary
		O	0 - 1 Binary		O	0 - 1 Binary
	Clear Sky Masks: Hemispheric	T	0 - 1 Binary	Clear Sky Masks: Hemispheric	T	0 - 1 Binary
		O	0 - 1 Binary		O	0 - 1 Binary
	Clear Sky Masks: Mesoscale	T	0 - 1 Binary	Clear Sky Masks: Mesoscale	T	0 - 1 Binary
		O	0 - 1 Binary		O	0 - 1 Binary
	Radiances: CONUS	T	180K-320K	Radiances: CONUS	T	180K-320K
		O	180K-330K		O	180K-330K
	Radiances: Hemispheric	T	180K-320K	Radiances: Hemispheric	T	180K-320K
		O	180K-330K		O	180K-330K
	Radiances: Mesoscale	T	180K-320K	Radiances: Mesoscale	T	180K-320K
		O	180K-330K		O	180K-330K
	RADIATION			RADIATION		
	Absorbed Shortwave Radiation: Surface/ Mesoscale	T	0 - 700 W/m^2	Absorbed Shortwave Radiation: Surface/ Mesoscale	T	0 - 700 W/m^2
		O	0 - 700 W/m^2		O	0 - 700 W/m^2
	Downward Longwave Radiation: Surface/CONUS	T	0 - 700 W/m^2	Downward Longwave Radiation: Surface/CONUS	T	0 - 700 W/m^2
		O	0 - 700 W/m2		O	0 - 700 W/m2
	Downward Longwave Radiation: Surface/Hemispheric	T	TBD	Downward Longwave Radiation: Surface/Hemispheric	T	TBD
		O	TBD		O	TBD
	Downward Solar Insolation:	T	0-1500 W/m2	Downward Solar Insolation:	T	0-1500 W/m2

ID	**NOAA's Mission Requirements Document 2B (MRD-2B) for the GOES-R Series**			**Text On Jan27 (MRD-2B draft)**		
	Surface/ CONUS			Surface/ CONUS		
		O	0-1500 W/m2		O	0-1500 W/m2
	Downward Solar Insolation: Surface/ Hemispheric	T	0-1500 W/m2	Downward Solar Insolation: Surface/ Hemispheric	T	0-1500 W/m2
		O	0-1500 W/m2		O	0-1500 W/m2
	Downward Solar Insolation: Surface/ Mesoscale	T	0-1500 W/m2	Downward Solar Insolation: Surface/ Mesoscale	T	0-1500 W/m2
		O	0-1500 W/m2		O	0-1500 W/m2
	Reflected Solar Insolation: TOA / CONUS	T	0-1500 W/m2	Reflected Solar Insolation: TOA / CONUS	T	0-1500 W/m2
		O	0-1500 W/m2		O	0-1500 W/m2
	Reflected Solar Insolation: TOA / Hemispheric	T	TBD	Reflected Solar Insolation: TOA / Hemispheric	T	TBD
		O	TBD		O	TBD
	Upward Longwave Radiation: Surface/CONUS	T	0-700 W/m2	Upward Longwave Radiation: Surface/CONUS	T	0-700 W/m2
		O	0-1000 W/m2		O	0-1000 W/m2
	Upward Longwave Radiation: Surface/Hemispheric	T	TBD	Upward Longwave Radiation: Surface/Hemispheric	T	TBD
		O	TBD		O	TBD
	Upward Longwave Radiation: TOA/ CONUS	T	0-700 W/m2	Upward Longwave Radiation: TOA/ CONUS	T	0-700 W/m2
		O	0-700 W/m2		O	0-700 W/m2
	Upward Longwave Radiation: TOA/ Hemispheric	T	0-700 W/m2	Upward Longwave Radiation: TOA/ Hemispheric	T	0-700 W/m2
		O	0-700 W/m2		O	0-700 W/m2
	TRACE GASES			TRACE GASES		
	CO Concentration	T	TBD	CO Concentration	T	TBD
		O	TBD		O	TBD
	Removed			Removed		

ID	NOAA's Mission Requirements Document 2B (MRD-2B) for the GOES-R Series			Text On Jan27 (MRD-2B draft)		
	Removed			Removed		
	Ozone Total: CONUS	T	100-650 DU	Ozone Total: CONUS	T	100-650 DU
		O	100-650 DU		O	100-650 DU
	Ozone Total: Hemispheric	T	100-650 DU	Ozone Total: Hemispheric	T	100-650 DU
		O	100-650 DU		O	100-650 DU
	SO_2 Detection	T	Binary Yes/No Above TBD Dobson Units (DU)	SO_2 Detection	T	Binary Yes/No Above TBD Dobson Units (DU)
		O	0-700 DU		O	0-700 DU
	WINDS			WINDS		
	Derived Motion Winds: CONUS	T	0-300 kts (0-155 m/s)	Derived Motion Winds: CONUS	T	0-300 kts (0-155 m/s)
		O	0-300 kts (0-155 m/s)		O	0-300 kts (0-155 m/s)
	Derived Motion Winds: Hemispheric	T	0-300 kts (0-155 m/s)	Derived Motion Winds: Hemispheric	T	0-300 kts (0-155 m/s)
		O	0-300 kts (0-155 m/s)		O	0-300 kts (0-155 m/s)
	Derived Motion Winds: Mesoscale	T	0-300 kts (0-155 m/s)	Derived Motion Winds: Mesoscale	T	0-300 kts (0-155 m/s)
		O	0-300 kts (0-155 m/s)		O	0-300 kts (0-155 m/s)
	Microburst Windspeed Potential	T	TBD	Microburst Windspeed Potential	T	TBD
		O	TBD		O	TBD

ID	**NOAA’s Mission Requirements Document 2B (MRD-2B) for the GOES-R Series**			**Text On Jan27 (MRD-2B draft)**		
6794	Observational Requirement *LAND*	LEVEL	Product Meas. Range	Observational Requirement *LAND*	LEVEL	Product Meas. Range
	Fire / Hot Spot Imagery: CONUS	T	275 - 400 K	Fire / Hot Spot Imagery: CONUS	T	275 - 400 K
		O	275 - 700 K		O	275 - 700 K
	Fire / Hot Spot Imagery: Hemispheric	T	275 - 400 K	Fire / Hot Spot Imagery: Hemispheric	T	275 - 400 K
		O	275 - 700 K		O	275 - 700 K
	Flood/Standing Water: Hemispheric	T	0 to 100%	Flood/Standing Water: Hemispheric	T	0 to 100%
		O	0 to 100%		O	0 to 100%
	Flood/Standing Water: Mesoscale	T	0 to 100%	Flood/Standing Water: Mesoscale	T	0 to 100%
		O	0 to 100%		O	0 to 100%
	Ice Cover/ Landlocked: Hemispheric	T	TBD	Ice Cover/ Landlocked: Hemispheric	T	TBD
		O	TBD		O	TBD
	Land Surface (Skin) Temperature: CONUS	T	233 - 333 K	Land Surface (Skin) Temperature: CONUS	T	233 - 333 K
		O	213 - 343 K		O	213 - 343 K
	Land Surface (Skin) Temperature: Hemispheric	T	230 - 330 K	Land Surface (Skin) Temperature: Hemispheric	T	230 - 330 K
		O	183 - 343 K		O	183 - 343 K
	Land Surface (Skin) Temperature: Mesoscale	T	213 - 333 K	Land Surface (Skin) Temperature: Mesoscale	T	213 - 333 K
		O	213 - 343 K		O	213 - 343 K
	Snow Cover: CONUS	T	Binary yes/no detection	Snow Cover: CONUS	T	Binary yes/no detection
		O	0.0 - 1.0 fractional cover		O	0.0 - 1.0 fractional

<table>
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<tr><td>Snow Cover: Hemispheric</td><td>T</td><td>Binary yes/no detection</td></tr>
<tr><td></td><td>O</td><td>0.0 - 1.0 fractional cover</td></tr>
<tr><td>Snow Cover: Mesoscale</td><td>T</td><td>Binary yes/no</td></tr>
<tr><td></td><td>O</td><td>0-90 cm</td></tr>
<tr><td>Snow Depth: CONUS</td><td>T</td><td>TBD</td></tr>
<tr><td></td><td>O</td><td>0-20 m</td></tr>
<tr><td>Snow Depth: Hemispheric</td><td>T</td><td>TBD</td></tr>
<tr><td></td><td>O</td><td>0-20 m</td></tr>
<tr><td>Snow Depth: Mesoscale</td><td>T</td><td>TBD</td></tr>
<tr><td></td><td>O</td><td>0-90 cm</td></tr>
<tr><td>Surface Albedo: Hemispheric</td><td>T</td><td>0 - 1 Albedo Units</td></tr>
<tr><td></td><td>O</td><td>0 - 1 Albedo Units</td></tr>
<tr><td>Surface Emissivity</td><td>T</td><td>0.85 - 1.0 (unitless)</td></tr>
<tr><td></td><td>O</td><td>0.70 - 1.0 (unitless)</td></tr>
<tr><td>Vegetation Fraction: Green</td><td>T</td><td>0.0 - 1.0 (unitless)</td></tr>
<tr><td></td><td>O</td><td>0.0 - 1.0 (unitless)</td></tr>
<tr><td>Vegetation Index: CONUS</td><td>T</td><td>0 - 1 (NDVI units)</td></tr>
<tr><td></td><td>O</td><td>0 - 1 (NDVI units)</td></tr>
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<table>
<tr><td></td><td></td><td>cover</td></tr>
<tr><td>Snow Cover: Hemispheric</td><td>T</td><td>Binary yes/no detection</td></tr>
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<tr><td>Snow Cover: Mesoscale</td><td>T</td><td>Binary yes/no</td></tr>
<tr><td></td><td>O</td><td>0-90 cm</td></tr>
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<tr><td></td><td>O</td><td>0 - 1 (NDVI units)</td></tr>
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<tr><td>6792</td><td>The mission product accuracies included in the four product accuracies tables below shall be met by the GOES-R system. The</td><td>The mission product accuracies included in the four product accuracies tables below shall be met by the GOES-R system. The T</td></tr>
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<table>
<tr><th>Observational Requirement</th><th>LEVEL</th><th>Product Accuracy</th></tr>
<tr><td><i>AEROSOLS</i></td><td></td><td></td></tr>
<tr><td>Aerosol Detection: CONUS (including Smoke and Dust)</td><td>T</td><td>TBD</td></tr>
<tr><td></td><td>O</td><td>TBD</td></tr>
<tr><td>Aerosol Detection: Hemispheric (including Smoke and Dust)</td><td>T</td><td>TBD</td></tr>
<tr><td></td><td>O</td><td>TBD</td></tr>
<tr><td>Aerosol Detection: Mesoscale (including Smoke and Dust)</td><td>T</td><td>TBD</td></tr>
<tr><td></td><td>O</td><td>TBD</td></tr>
<tr><td>Aerosol Particle Size</td><td>T</td><td>TBD</td></tr>
<tr><td></td><td>O</td><td>TBD</td></tr>
<tr><td>Dust/Aerosol: Loading: CONUS</td><td>T</td><td>TBD</td></tr>
<tr><td></td><td>O</td><td>TBD</td></tr>
<tr><td>Dust/Aerosol: Loading: Hemispheric</td><td>T</td><td>TBD</td></tr>
<tr><td></td><td>O</td><td>TBD</td></tr>
<tr><td>Suspended Matter / Optical Depth: CONUS</td><td>T</td><td>0.05 land, 0.03 ocean</td></tr>
<tr><td></td><td>O</td><td>0.05 land, 0.01 ocean</td></tr>
<tr><td>Suspended Matter / Optical Depth:</td><td>T</td><td>0.05 land,</td></tr>
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<tr><td>Aerosol Detection: Mesoscale (including Smoke and Dust)</td><td>T</td><td>TBD</td></tr>
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<tr><td>Aerosol Particle Size</td><td>T</td><td>TBD</td></tr>
<tr><td></td><td>O</td><td>TBD</td></tr>
<tr><td>Dust/Aerosol: Loading: CONUS</td><td>T</td><td>TBD</td></tr>
<tr><td></td><td>O</td><td>TBD</td></tr>
<tr><td>Dust/Aerosol: Loading: Hemispheric</td><td>T</td><td>TBD</td></tr>
<tr><td></td><td>O</td><td>TBD</td></tr>
<tr><td>Suspended Matter: CONUS</td><td>T</td><td>TBD</td></tr>
<tr><td></td><td>O</td><td>TBD</td></tr>
<tr><td>Suspended Matter: Hemispheric</td><td>T</td><td>TBD</td></tr>
<tr><td></td><td>O</td><td>TBD</td></tr>
<tr><td>Suspended Matter: Hemispheric</td><td>T</td><td>TBD</td></tr>
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<tr><td>Hemispheric</td><td></td><td>0.03 ocean</td></tr>
<tr><td></td><td>O</td><td>0.05 land,
0.01 ocean</td></tr>
<tr><td>Volcanic Ash: Detection and Height</td><td>T</td><td>2 ton/km^2</td></tr>
<tr><td></td><td>O</td><td>0.3 ton/km^2</td></tr>
<tr><td><i>CLOUDS</i></td><td></td><td></td></tr>
<tr><td>Aircraft Icing Threat</td><td>T</td><td>2 categories</td></tr>
<tr><td></td><td>O</td><td>1 category</td></tr>
<tr><td>Cloud Base Height: CONUS</td><td>T</td><td>2 km</td></tr>
<tr><td></td><td>O</td><td>0.1 km</td></tr>
<tr><td>Cloud Base Height: Hemispheric</td><td>T</td><td>2 km</td></tr>
<tr><td></td><td>O</td><td>0.1 km</td></tr>
<tr><td>Cloud Base Height: Mesoscale</td><td>T</td><td>2 km</td></tr>
<tr><td></td><td>O</td><td>0.1 km</td></tr>
<tr><td>Cloud Ice Water Path: CONUS</td><td>T</td><td>Greater of 0.1 mm or 25%; only thinnest clouds at night.</td></tr>
<tr><td></td><td>O</td><td>Greater of 0.05 mm or 10%</td></tr>
<tr><td>Cloud Ice Water Path: Hemispheric</td><td>T</td><td>Greater of 0.1 mm or 25%; only thinnest clouds at night.</td></tr>
<tr><td></td><td>O</td><td>Greater of 0.05 mm or 10%</td></tr>
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<table>
<tr><td></td><td>O</td><td>TBD</td></tr>
<tr><td>Volcanic Ash: Detection and Height</td><td>T</td><td>2 ton/km^2</td></tr>
<tr><td></td><td>O</td><td>0.3 ton/km^2</td></tr>
<tr><td><i>CLOUDS</i></td><td></td><td></td></tr>
<tr><td>Aircraft Icing Threat</td><td>T</td><td>2 categories</td></tr>
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<tr><td>Cloud Base Height: CONUS</td><td>T</td><td>2 km</td></tr>
<tr><td></td><td>O</td><td>0.1 km</td></tr>
<tr><td>Cloud Base Height: Hemispheric</td><td>T</td><td>2 km</td></tr>
<tr><td></td><td>O</td><td>0.1 km</td></tr>
<tr><td>Cloud Base Height: Mesoscale</td><td>T</td><td>2 km</td></tr>
<tr><td></td><td>O</td><td>0.1 km</td></tr>
<tr><td>Cloud Ice Water Path: CONUS</td><td>T</td><td>Greater of 0.1 mm or 25%; only thinnest clouds at night.</td></tr>
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<tr><td></td><td>O</td><td>Greater of 0.05 mm or 10%</td></tr>
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NOAA's Mission Requirements Document 2B (MRD-2B) for the GOES-R Series

Cloud Ice Water Path: Mesoscale	T	Day: Greater of 0.1 mm or 25%, Night: only thinnest clouds
	O	Greater of 0.05 mm or 10%
Cloud Imagery: Coastal	T	n/a
	O	n/a
Cloud Layers/ Heights and Thickness: CONUS	T	Thickness: TBD Height: TBD
	O	Thickness: TBD Height: TBD
Cloud Layers/ Heights and Thickness: Hemispheric	T	Thickness: TBD Height: TBD
	O	Sfc-2km: ±30 m 2-20 km: ±150m
Cloud Layers/ Heights and Thickness: Mesoscale	T	Thickness: TBD Height: TBD
	O	Thickness: TBD Height: TBD
Cloud Liquid Water: CONUS	T	Day: Greater of 0.1 mm or

Text On Jan27 (MRD-2B draft)

Cloud Ice Water Path: Mesoscale	T	Day: Greater of 0.1 mm or 25%, Night: only thinnest clouds
	O	Greater of 0.05 mm or 10%
Cloud Imagery: Coastal	T	n/a
	O	n/a
Cloud Layers/ Heights and Thickness: CONUS	T	Thickness: TBD Height: TBD
	O	Thickness: TBD Height: TBD
Cloud Layers/ Heights and Thickness: Hemispheric	T	Thickness: TBD Height: TBD
	O	Sfc-2km: ±30 m 2-20 km: ±150m
Cloud Layers/ Heights and Thickness: Mesoscale	T	Thickness: TBD Height: TBD

ID	**NOAA's Mission Requirements Document 2B (MRD-2B) for the GOES-R Series**			**Text On Jan27 (MRD-2B draft)**		
			25% Night: only thinnest clouds		O	Thickness: TBD Height: TBD
		O	Day: Greater of 0.1 mm or 25% Night: only thinnest clouds	Cloud Liquid Water: CONUS	T	Day: Greater of 0.1 mm or 25% Night: only thinnest clouds
	Cloud Liquid Water: Hemispheric	T	Day: Greater of 0.1 mm or 25% Night: only thinnest clouds		O	Day: Greater of 0.1 mm or 25% Night: only thinnest clouds
		O	Day: Greater of 0.01 mm or 25% Night: only thinnest clouds	Cloud Liquid Water: Hemispheric	T	Day: Greater of 0.1 mm or 25% Night: only thinnest clouds
	Cloud Liquid Water: Mesoscale	T	Greater of 0.1 mm or 25% in day and at night only thinnest clouds		O	Day: Greater of 0.01 mm or 25% Night: only thinnest
		O	Greater of 0.1 mm or 10% in day and at night only thinnest clouds			
	Cloud & Moisture Imagery: CONUS	T	TBD			

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<tr><td></td><td>O</td><td>TBD</td></tr>
<tr><td>Cloud & Moisture Imagery: Hemispheric</td><td>T</td><td>n/a</td></tr>
<tr><td></td><td>O</td><td>n/a</td></tr>
<tr><td>Cloud & Moisture Imagery: Mesoscale</td><td>T</td><td>n/a</td></tr>
<tr><td></td><td>O</td><td>n/a</td></tr>
<tr><td>Cloud Optical Depth: CONUS</td><td>T</td><td>10%</td></tr>
<tr><td></td><td>O</td><td>TBD</td></tr>
<tr><td>Cloud Optical Depth: Hemispheric</td><td>T</td><td>10%</td></tr>
<tr><td></td><td>O</td><td>2%</td></tr>
<tr><td>Cloud Particle Size Distribution: CONUS</td><td>T</td><td>4 µm</td></tr>
<tr><td></td><td>O</td><td>0.5 µm</td></tr>
<tr><td>Cloud Particle Size Distribution: Hemispheric</td><td>T</td><td>4 µm</td></tr>
<tr><td></td><td>O</td><td>0.5 µm</td></tr>
<tr><td>Cloud Particle Size Distribution: Mesoscale</td><td>T</td><td>4 µm</td></tr>
<tr><td></td><td>O</td><td>0.5 µm</td></tr>
<tr><td>Cloud Top Phase: CONUS</td><td>T</td><td>TBD</td></tr>
<tr><td></td><td>O</td><td>TBD</td></tr>
<tr><td>Cloud Top Phase: Hemispheric</td><td>T</td><td>TBD</td></tr>
<tr><td></td><td>O</td><td>TBD</td></tr>
<tr><td>Cloud Top Phase: Mesoscale</td><td>T</td><td>TBD</td></tr>
<tr><td></td><td>O</td><td>TBD</td></tr>
<tr><td>Cloud Top Height: CONUS</td><td>T</td><td>Sfc-500 mb: 300-500 m
500-300 mb: 1-2 km</td></tr>
<tr><td></td><td>O</td><td>50 m</td></tr>
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<table>
<tr><td></td><td></td><td>clouds</td></tr>
<tr><td>Cloud Liquid Water: Mesoscale</td><td>T</td><td>Greater of 0.1 mm or 25% in day and at night only thinnest clouds</td></tr>
<tr><td></td><td>O</td><td>Greater of 0.1 mm or 10% in day and at night only thinnest clouds</td></tr>
<tr><td>Cloud & Moisture Imagery: CONUS</td><td>T</td><td>TBD</td></tr>
<tr><td></td><td>O</td><td>TBD</td></tr>
<tr><td>Cloud & Moisture Imagery: Hemispheric</td><td>T</td><td>n/a</td></tr>
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<tr><td>Cloud & Moisture Imagery: Mesoscale</td><td>T</td><td>n/a</td></tr>
<tr><td></td><td>O</td><td>n/a</td></tr>
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<tr><td></td><td>O</td><td>0.5 µm</td></tr>
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500-300 mb: 1-2 km</td></tr>
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500-300 mb: 1-2 km</td></tr>
<tr><td></td><td>O</td><td>10-100 km</td></tr>
<tr><td>Cloud Top Pressure: CONUS</td><td>T</td><td>Sfc-500 mb: 300-500 m
500-300 mb: 1-2 km</td></tr>
<tr><td></td><td>O</td><td>50 m</td></tr>
<tr><td>Cloud Top Pressure: Hemispheric</td><td>T</td><td>Sfc-500 mb: 300-500 m
500-300 mb: 1-2 km</td></tr>
<tr><td></td><td>O</td><td>TBD</td></tr>
<tr><td>Cloud Top Temperature: Hemispheric</td><td>T</td><td>1 K</td></tr>
<tr><td></td><td>O</td><td>0.3 K</td></tr>
<tr><td>Cloud Top Temperature: Mesoscale</td><td>T</td><td>0.5 K</td></tr>
<tr><td></td><td>O</td><td>0.5 K</td></tr>
<tr><td>Cloud Type: CONUS</td><td>T</td><td>TBD</td></tr>
<tr><td></td><td>O</td><td>TBD</td></tr>
<tr><td>Cloud Type: Hemispheric</td><td>T</td><td>TBD</td></tr>
<tr><td></td><td>O</td><td>TBD</td></tr>
<tr><td>Cloud Type: Mesoscale</td><td>T</td><td>TBD</td></tr>
<tr><td></td><td>O</td><td>15 min</td></tr>
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<tr><td></td><td>O</td><td>0.5 µm</td></tr>
<tr><td>Cloud Particle Size Distribution: Mesoscale</td><td>T</td><td>4 µm</td></tr>
<tr><td></td><td>O</td><td>0.5 µm</td></tr>
<tr><td>Cloud Top Phase: CONUS</td><td>T</td><td>TBD</td></tr>
<tr><td></td><td>O</td><td>TBD</td></tr>
<tr><td>Cloud Top Phase: Hemispheric</td><td>T</td><td>TBD</td></tr>
<tr><td></td><td>O</td><td>TBD</td></tr>
<tr><td>Cloud Top Phase: Mesoscale</td><td>T</td><td>TBD</td></tr>
<tr><td></td><td>O</td><td>TBD</td></tr>
<tr><td>Cloud Top Height: CONUS</td><td>T</td><td>Sfc-500 mb: 300-500 m
500-300 mb: 1-2 km</td></tr>
<tr><td></td><td>O</td><td>50 m</td></tr>
<tr><td>Cloud Top Height: Hemispheric</td><td>T</td><td>Sfc-500 mb: 300-500 m
500-300 mb: 1-2 km</td></tr>
<tr><td></td><td>O</td><td>0.25 km</td></tr>
<tr><td>Cloud Top Height: Mesoscale</td><td>T</td><td>Sfc-500 mb: 300-500 m
500-300 mb: 1-2 km</td></tr>
<tr><td></td><td>O</td><td>10-100 km</td></tr>
<tr><td>Cloud Top Pressure: CONUS</td><td>T</td><td>Sfc-500 mb: 300-500 m
500-300 mb: 1-2 km</td></tr>
<tr><td></td><td>O</td><td>50 m</td></tr>
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<table>
<tr><td>Convective Initiation</td><td>T</td><td>TBD</td></tr>
<tr><td></td><td>O</td><td>TBD</td></tr>
<tr><td>Enhanced "V"/Overshooting Top Detection: CONUS</td><td>T</td><td>10 % Detection (1 K Top)</td></tr>
<tr><td></td><td>O</td><td>5 % Detection (0.5 K Top)</td></tr>
<tr><td>Enhanced "V"/Overshooting Top Detection: Mesoscale</td><td>T</td><td>10%</td></tr>
<tr><td></td><td>O</td><td>5%</td></tr>
<tr><td>Hurricane Intensity</td><td>T</td><td>5 m/s</td></tr>
<tr><td></td><td>O</td><td>TBD</td></tr>
<tr><td>Imagery: All-Weather/Day-Night: Global</td><td>T</td><td>TBD</td></tr>
<tr><td></td><td>O</td><td>TBD</td></tr>
<tr><td>Lightning Detection: CONUS</td><td>T</td><td>70-90% total strikes detection</td></tr>
<tr><td></td><td>O</td><td>99% total strikes detection</td></tr>
<tr><td>Lightning Detection: Hemispheric</td><td>T</td><td>70-90% total strikes detection</td></tr>
<tr><td></td><td>O</td><td>99% total strikes detection</td></tr>
<tr><td>Lightning Detection: Mesoscale</td><td>T</td><td>70-90% total strikes detection</td></tr>
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<table>
<tr><td>Cloud Top Pressure: Hemispheric</td><td>T</td><td>Sfc-500 mb: 300-500 m
500-300 mb: 1-2 km</td></tr>
<tr><td></td><td>O</td><td>TBD</td></tr>
<tr><td>Cloud Top Temperature: Hemispheric</td><td>T</td><td>1 K</td></tr>
<tr><td></td><td>O</td><td>0.3 K</td></tr>
<tr><td>Cloud Top Temperature: Mesoscale</td><td>T</td><td>0.5 K</td></tr>
<tr><td></td><td>O</td><td>0.5 K</td></tr>
<tr><td>Cloud Type: CONUS</td><td>T</td><td>TBD</td></tr>
<tr><td></td><td>O</td><td>TBD</td></tr>
<tr><td>Cloud Type: Hemispheric</td><td>T</td><td>TBD</td></tr>
<tr><td></td><td>O</td><td>TBD</td></tr>
<tr><td>Cloud Type: Mesoscale</td><td>T</td><td>TBD</td></tr>
<tr><td></td><td>O</td><td>15 min</td></tr>
<tr><td>Convective Initiation</td><td>T</td><td>TBD</td></tr>
<tr><td></td><td>O</td><td>TBD</td></tr>
<tr><td>Enhanced "V"/Overshooting Top Detection: CONUS</td><td>T</td><td>10 % Detection (1 K Top)</td></tr>
<tr><td></td><td>O</td><td>5 % Detection (0.5 K Top)</td></tr>
<tr><td>Enhanced "V"/Overshooting Top Detection: Mesoscale</td><td>T</td><td>10%</td></tr>
<tr><td></td><td>O</td><td>5%</td></tr>
<tr><td>Hurricane Intensity</td><td>T</td><td>5 m/s</td></tr>
<tr><td></td><td>O</td><td>TBD</td></tr>
<tr><td>Imagery: All-Weather/Day-Night: Global</td><td>T</td><td>TBD</td></tr>
<tr><td></td><td>O</td><td>TBD</td></tr>
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<tr><td></td><td>O</td><td>99% total strikes detection</td></tr>
<tr><td>Low Cloud and Fog</td><td>T</td><td>70% Detection</td></tr>
<tr><td></td><td>O</td><td>90% Detection</td></tr>
<tr><td>Turbulence: Hemispheric</td><td>T</td><td>TBD</td></tr>
<tr><td></td><td>O</td><td>TBD</td></tr>
<tr><td>Turbulence: Mesoscale</td><td>T</td><td>TBD</td></tr>
<tr><td></td><td>O</td><td>TBD</td></tr>
<tr><td>Visibility: Coastal</td><td>T</td><td>TBD</td></tr>
<tr><td></td><td>O</td><td>400 m</td></tr>
<tr><td>Visibility: Hemispheric</td><td>T</td><td>TBD</td></tr>
<tr><td></td><td>O</td><td>± 1 km</td></tr>
<tr><td><i>PRECIPITATION</i></td><td></td><td></td></tr>
<tr><td>Probability of Rainfall</td><td>T</td><td>25%</td></tr>
<tr><td></td><td>O</td><td>10%</td></tr>
<tr><td>Rainfall Potential</td><td>T</td><td>5 mm/hr</td></tr>
<tr><td></td><td>O</td><td>2 mm/hr</td></tr>
<tr><td>Rainfall Rate/QPE</td><td>T</td><td>2 mm/hr</td></tr>
<tr><td></td><td>O</td><td>1 mm/hr</td></tr>
<tr><td>PROFILES</td><td></td><td></td></tr>
<tr><td>Atmospheric Vertical Moisture Profile: CONUS</td><td>T</td><td>Sfc-500 mb: 10 % 500-300 mb: 10% 300-100 mb: 20%</td></tr>
<tr><td></td><td>O</td><td>Sfc-500 mb: 5% 500-300 mb: 5% 300-</td></tr>
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<tr><td>Lightning Detection: CONUS</td><td>T</td><td>70-90% total strikes detection</td></tr>
<tr><td></td><td>O</td><td>99% total strikes detection</td></tr>
<tr><td>Lightning Detection: Hemispheric</td><td>T</td><td>70-90% total strikes detection</td></tr>
<tr><td></td><td>O</td><td>99% total strikes detection</td></tr>
<tr><td>Lightning Detection: Mesoscale</td><td>T</td><td>70-90% total strikes detection</td></tr>
<tr><td></td><td>O</td><td>99% total strikes detection</td></tr>
<tr><td>Low Cloud and Fog</td><td>T</td><td>70% Detection</td></tr>
<tr><td></td><td>O</td><td>90% Detection</td></tr>
<tr><td>Turbulence: Hemispheric</td><td>T</td><td>TBD</td></tr>
<tr><td></td><td>O</td><td>TBD</td></tr>
<tr><td>Turbulence: Mesoscale</td><td>T</td><td>TBD</td></tr>
<tr><td></td><td>O</td><td>TBD</td></tr>
<tr><td>Visibility: Coastal</td><td>T</td><td>TBD</td></tr>
<tr><td></td><td>O</td><td>400 m</td></tr>
<tr><td>Visibility: Hemispheric</td><td>T</td><td>TBD</td></tr>
<tr><td></td><td>O</td><td>± 1 km</td></tr>
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<tr><td>Atmospheric Vertical Moisture Profile: Hemispheric</td><td>T</td><td>Sfc-500 mb: 10 % 500-300 mb: 10% 300-100 mb: 20%</td></tr>
<tr><td></td><td>O</td><td>Sfc-500 mb: 5% 500-300 mb: 5% 300-100 mb: 10%</td></tr>
<tr><td>Atmospheric Vertical Moisture Profile: Mesoscale</td><td>T</td><td>Sfc-500 mb: 10 % 500-300 mb: 10% 300-100 mb: 20%</td></tr>
<tr><td></td><td>O</td><td>Sfc-500 mb: 5% 500-300 mb: 5% 300-100 mb: 10%</td></tr>
<tr><td>Atmospheric Vertical Temperature Profile: CONUS</td><td>T</td><td>1 K</td></tr>
<tr><td></td><td>O</td><td>0.5 K</td></tr>
<tr><td>Atmospheric Vertical Temperature Profile: Hemispheric</td><td>T</td><td>1 K</td></tr>
<tr><td></td><td>O</td><td>0.5 K</td></tr>
<tr><td>Atmospheric Vertical Temperature Profile: Mesoscale</td><td>T</td><td>1 K</td></tr>
<tr><td></td><td>O</td><td>0.5 K</td></tr>
<tr><td>Capping Inversion Information: CONUS</td><td>T</td><td>T: 10K Td: 10K Hgt: 150-250 mb</td></tr>
<tr><td></td><td>O</td><td>T: 10K Td: 10K Hgt: 150-</td></tr>
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<table>
<tr><td><i>PRECIPITATION</i></td><td></td><td></td></tr>
<tr><td>Probability of Rainfall</td><td>T</td><td>25%</td></tr>
<tr><td></td><td>O</td><td>10%</td></tr>
<tr><td>Rainfall Potential</td><td>T</td><td>5 mm/hr</td></tr>
<tr><td></td><td>O</td><td>2 mm/hr</td></tr>
<tr><td>Rainfall Rate/QPE</td><td>T</td><td>2 mm/hr</td></tr>
<tr><td></td><td>O</td><td>1 mm/hr</td></tr>
<tr><td>PROFILES</td><td></td><td></td></tr>
<tr><td>Atmospheric Vertical Moisture Profile: CONUS</td><td>T</td><td>Sfc-500 mb: 10 % 500-300 mb: 10% 300-100 mb: 20%</td></tr>
<tr><td></td><td>O</td><td>Sfc-500 mb: 5% 500-300 mb: 5% 300-100 mb: 10%</td></tr>
<tr><td>Atmospheric Vertical Moisture Profile: Hemispheric</td><td>T</td><td>Sfc-500 mb: 10 % 500-300 mb: 10% 300-100 mb: 20%</td></tr>
<tr><td></td><td>O</td><td>Sfc-500 mb: 5% 500-300 mb: 5% 300-100 mb: 10%</td></tr>
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<tr><td></td><td></td><td>250 mb</td></tr>
<tr><td>Capping Inversion Information: Mesoscale</td><td>T</td><td>0.5 K (TBS)</td></tr>
<tr><td></td><td>O</td><td>0.5 K</td></tr>
<tr><td>Derived Stability Indices: CONUS</td><td>T</td><td>TBD</td></tr>
<tr><td></td><td>O</td><td>TBD</td></tr>
<tr><td>Derived Stability Indices: Mesoscale</td><td>T</td><td>10%</td></tr>
<tr><td></td><td>O</td><td>5%</td></tr>
<tr><td>Moisture Flux: CONUS</td><td>T</td><td>10%</td></tr>
<tr><td></td><td>O</td><td>5%</td></tr>
<tr><td>Moisture Flux: Hemispheric</td><td>T</td><td>10%</td></tr>
<tr><td></td><td>O</td><td>5%</td></tr>
<tr><td>Moisture Flux: Mesoscale</td><td>T</td><td>10%</td></tr>
<tr><td></td><td>O</td><td>5%</td></tr>
<tr><td>Pressure Profile: Mesoscale</td><td>T</td><td>TBD</td></tr>
<tr><td></td><td>O</td><td>± 2.5%</td></tr>
<tr><td>Total Precipitable Water: Hemispheric</td><td>T</td><td>TBD</td></tr>
<tr><td></td><td>O</td><td>TBD</td></tr>
<tr><td>Total Water Content: CONUS</td><td>T</td><td>TBD</td></tr>
<tr><td></td><td>O</td><td>1 mm</td></tr>
<tr><td>Total Water Content: Hemispheric</td><td>T</td><td>TBD</td></tr>
<tr><td></td><td>O</td><td>1 mm</td></tr>
<tr><td>Total Water Content: Mesoscale</td><td>T</td><td>TBD</td></tr>
<tr><td></td><td>O</td><td>1 mm</td></tr>
<tr><td>RADIANCES</td><td></td><td></td></tr>
<tr><td>Clear Sky Masks: CONUS</td><td>T</td><td>10%</td></tr>
<tr><td></td><td>O</td><td>5%</td></tr>
<tr><td>Clear Sky Masks: Hemispheric</td><td>T</td><td>10%</td></tr>
<tr><td></td><td>O</td><td>5%</td></tr>
<tr><td>Clear Sky Masks: Mesoscale</td><td>T</td><td>10%</td></tr>
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<tr><td>Mesoscale</td><td></td><td>10 % 500-300 mb: 10% 300-100 mb: 20%</td></tr>
<tr><td></td><td>O</td><td>Sfc-500 mb: 5% 500-300 mb: 5% 300-100 mb: 10%</td></tr>
<tr><td>Atmospheric Vertical Temperature Profile: CONUS</td><td>T</td><td>1 K</td></tr>
<tr><td></td><td>O</td><td>0.5 K</td></tr>
<tr><td>Atmospheric Vertical Temperature Profile: Hemispheric</td><td>T</td><td>1 K</td></tr>
<tr><td></td><td>O</td><td>0.5 K</td></tr>
<tr><td>Atmospheric Vertical Temperature Profile: Mesoscale</td><td>T</td><td>1 K</td></tr>
<tr><td></td><td>O</td><td>0.5 K</td></tr>
<tr><td>Capping Inversion Information: CONUS</td><td>T</td><td>T: 10K Td: 10K Hgt: 150-250 mb</td></tr>
<tr><td></td><td>O</td><td>T: 10K Td: 10K Hgt: 150-250 mb</td></tr>
<tr><td>Capping Inversion Information: Mesoscale</td><td>T</td><td>0.5 K (TBS)</td></tr>
<tr><td></td><td>O</td><td>0.5 K</td></tr>
<tr><td>Derived Stability Indices: CONUS</td><td>T</td><td>TBD</td></tr>
<tr><td></td><td>O</td><td>TBD</td></tr>
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ID	NOAA's Mission Requirements Document 2B (MRD-2B) for the GOES-R Series	Text On Jan27 (MRD-2B draft)

	O	5%
Radiances: CONUS	T	TBD
	O	TBD
Radiances: Hemispheric	T	TBD
	O	TBD
Radiances: Mesoscale	T	TBD
	O	TBD
RADIATION		
Absorbed Shortwave Radiation: Surface/ Mesoscale	T	7 W/m^2
	O	5 W/m^2
Downward Longwave Radiation: Surface/CONUS	T	TBD
	O	5 W/m^2
Downward Longwave Radiation: Surface/Hemispheric	T	TBD
	O	5 W/m^2
Downward Solar Insolation: Surface/ CONUS	T	+/- 60 W/m^2 at high end of range (1500 W/m^2) +/- 40 W/m^2 at typical value/mid-point (350 W/m^2)
	O	+/- 60 W/m^2 at high end of range (1500 W/m^2) +/- 40

Derived Stability Indices: Mesoscale	T	10%
	O	5%
Moisture Flux: CONUS	T	10%
	O	5%
Moisture Flux: Hemispheric	T	10%
	O	5%
Moisture Flux: Mesoscale	T	10%
	O	5%
Pressure Profile: Mesoscale	T	TBD
	O	± 2.5%
Total Precipitable Water: Hemispheric	T	TBD
	O	TBD
Total Water Content: CONUS	T	TBD
	O	1 mm
Total Water Content: Hemispheric	T	TBD
	O	1 mm
Total Water Content: Mesoscale	T	TBD
	O	1 mm
RADIANCES		
Clear Sky Masks: CONUS	T	10%
	O	5%
Clear Sky Masks: Hemispheric	T	10%
	O	5%
Clear Sky Masks: Mesoscale	T	10%
	O	5%
Radiances: CONUS	T	TBD
	O	TBD
Radiances: Hemispheric	T	TBD
	O	TBD
Radiances: Mesoscale	T	TBD

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<tr><td></td><td></td><td>W/m^2 at typical value/mid-point (350 W/m^2)</td></tr>
<tr><td>Downward Solar Insolation: Surface/ Hemispheric</td><td>T</td><td>+/- 60 W/m^2 at high end of range (1500 W/m^2) +/- 40 W/m^2 at typical value/mid-point (350 W/m^2)</td></tr>
<tr><td></td><td>O</td><td>+/- 60 W/m^2 at high end of range (1500 W/m^2) +/- 40 W/m^2 at typical value/mid-point (350 W/m^2)</td></tr>
<tr><td>Downward Solar Insolation: Surface/ Mesoscale</td><td>T</td><td>+/- 60 W/m^2 at high end of range (1500 W/m^2) +/- 40 W/m^2 at typical value/mid-point (350</td></tr>
</table>
</td><td>
<table>
<tr><td></td><td>O</td><td>TBD</td></tr>
<tr><td>RADIATION</td><td></td><td></td></tr>
<tr><td>Absorbed Shortwave Radiation: Surface/ Mesoscale</td><td>T</td><td>7 W/m^2</td></tr>
<tr><td></td><td>O</td><td>5 W/m^2</td></tr>
<tr><td>Downward Longwave Radiation: Surface/CONUS</td><td>T</td><td>TBD</td></tr>
<tr><td></td><td>O</td><td>5 W/m^2</td></tr>
<tr><td>Downward Longwave Radiation: Surface/Hemispheric</td><td>T</td><td>TBD</td></tr>
<tr><td></td><td>O</td><td>5 W/m^2</td></tr>
<tr><td>Downward Solar Insolation: Surface/ CONUS</td><td>T</td><td>+/- 60 W/m^2 at high end of range (1500 W/m^2) +/- 40 W/m^2 at typical value/mid-point (350 W/m^2)</td></tr>
<tr><td></td><td>O</td><td>+/- 60 W/m^2 at high end of range (1500 W/m^2) +/- 40 W/m^2 at typical value/mid-point (350 W/m^2)</td></tr>
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ID	NOAA's Mission Requirements Document 2B (MRD-2B) for the GOES-R Series			Text On Jan27 (MRD-2B draft)		
			W/m^2)	Downward Solar Insolation: Surface/ Hemispheric	T	+/- 60 W/m^2 at high end of range (1500 W/m^2) +/- 40 W/m^2 at typical value/mid-point (350 W/m^2)
		O	+/- 60 W/m^2 at high end of range (1500 W/m^2) +/- 40 W/m^2 at typical value/mid-point (350 W/m^2)		O	+/- 60 W/m^2 at high end of range (1500 W/m^2) +/- 40 W/m^2 at typical value/mid-point (350 W/m^2)
	Reflected Solar Insolation: TOA / CONUS	T	+/- 60 W/m^2 at high end of range (1500 W/m^2) +/- 40 W/m^2 at typical value/mid-point (350 W/m^2)	Downward Solar Insolation: Surface/ Mesoscale	T	+/- 60 W/m^2 at high end of range (1500 W/m^2) +/- 40 W/m^2 at typical value/mid-point (350 W/m^2)
		O	+/- 60 W/m^2 at high end of range (1500 W/m^2) +/- 40 W/m^2 at typical value/mid-point (350 W/m^2)		O	+/- 60
	Reflected Solar Insolation: TOA / Hemispheric	T	TBD			
		O	5 W/m^2			

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<table>
<tr><td>Upward Longwave Radiation: Surface/CONUS</td><td>T</td><td>TBD</td></tr>
<tr><td></td><td>O</td><td>5 W/m^2</td></tr>
<tr><td>Upward Longwave Radiation: Surface/Hemispheric</td><td>T</td><td>TBD</td></tr>
<tr><td></td><td>O</td><td>5 W/m^2</td></tr>
<tr><td>Upward Longwave Radiation: TOA/ CONUS</td><td>T</td><td>20 W/m^2</td></tr>
<tr><td></td><td>O</td><td>5 W/m^2</td></tr>
<tr><td>Upward Longwave Radiation: TOA/ Hemispheric</td><td>T</td><td>20 W/m^2</td></tr>
<tr><td></td><td>O</td><td>1 W/m^2</td></tr>
<tr><td>TRACE GASES</td><td></td><td></td></tr>
<tr><td>CO Concentration</td><td>T</td><td>TBD</td></tr>
<tr><td></td><td>O</td><td>+/- 5%</td></tr>
<tr><td>Removed</td><td></td><td></td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td>Removed</td><td></td><td></td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td>Ozone Total: CONUS</td><td>T</td><td>6%</td></tr>
<tr><td></td><td>O</td><td>2%</td></tr>
<tr><td>Ozone Total: Hemispheric</td><td>T</td><td>TBD</td></tr>
<tr><td></td><td>O</td><td>TBD</td></tr>
<tr><td>SO_2 Detection</td><td>T</td><td>1%</td></tr>
<tr><td></td><td>O</td><td>TBD</td></tr>
<tr><td>WINDS</td><td></td><td></td></tr>
<tr><td>Derived Motion Winds: CONUS</td><td>T</td><td>High level: 6 m/s, Mid level 4 m/s, Low level: 2.5 m/s</td></tr>
</table>
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<table>
<tr><td></td><td></td><td>W/m^2 at high end of range (1500 W/m^2) +/- 40 W/m^2 at typical value/mid-point (350 W/m^2)</td></tr>
<tr><td>Reflected Solar Insolation: TOA / CONUS</td><td>T</td><td>+/- 60 W/m^2 at high end of range (1500 W/m^2) +/- 40 W/m^2 at typical value/mid-point (350 W/m^2)</td></tr>
<tr><td></td><td>O</td><td>+/- 60 W/m^2 at high end of range (1500 W/m^2) +/- 40 W/m^2 at typical value/mid-point (350 W/m^2)</td></tr>
<tr><td>Reflected Solar Insolation: TOA / Hemispheric</td><td>T</td><td>TBD</td></tr>
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<tr><td></td><td>
<table>
<tr><td></td><td>O</td><td>0.5 m/s</td></tr>
<tr><td>Derived Motion Winds: Hemispheric</td><td>T</td><td>High level: 6 m/s, Mid level 4 m/s, Low level: 2.5 m/s</td></tr>
<tr><td></td><td>O</td><td>0.5 m/s</td></tr>
<tr><td>Derived Motion Winds: Mesoscale</td><td>T</td><td>High level: 6 m/s, Mid level 4 m/s, Low level: 2.5 m/s</td></tr>
<tr><td></td><td>O</td><td>0.5 m/s</td></tr>
<tr><td>Microburst Windspeed Potential</td><td>T</td><td>TBD</td></tr>
<tr><td></td><td>O</td><td>TBD</td></tr>
</table>
</td><td>
<table>
<tr><td></td><td>O</td><td>5 W/m^2</td></tr>
<tr><td>Upward Longwave Radiation: Surface/CONUS</td><td>T</td><td>TBD</td></tr>
<tr><td></td><td>O</td><td>5 W/m^2</td></tr>
<tr><td>Upward Longwave Radiation: Surface/Hemispheric</td><td>T</td><td>TBD</td></tr>
<tr><td></td><td>O</td><td>5 W/m^2</td></tr>
<tr><td>Upward Longwave Radiation: TOA/ CONUS</td><td>T</td><td>20 W/m^2</td></tr>
<tr><td></td><td>O</td><td>5 W/m^2</td></tr>
<tr><td>Upward Longwave Radiation: TOA/ Hemispheric</td><td>T</td><td>20 W/m^2</td></tr>
<tr><td></td><td>O</td><td>1 W/m^2</td></tr>
<tr><td>TRACE GASES</td><td></td><td></td></tr>
<tr><td>CO Concentration</td><td>T</td><td>TBD</td></tr>
<tr><td></td><td>O</td><td>+/- 5%</td></tr>
<tr><td>Removed</td><td></td><td></td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td>Removed</td><td></td><td></td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td>Ozone Total: CONUS</td><td>T</td><td>6%</td></tr>
<tr><td></td><td>O</td><td>2%</td></tr>
<tr><td>Ozone Total: Hemispheric</td><td>T</td><td>TBD</td></tr>
<tr><td></td><td>O</td><td>TBD</td></tr>
<tr><td>SO_2 Detection</td><td>T</td><td>1%</td></tr>
<tr><td></td><td>O</td><td>TBD</td></tr>
<tr><td>WINDS</td><td></td><td></td></tr>
<tr><td>Derived Motion Winds: CONUS</td><td>T</td><td>High level: 6 m/s, Mid level 4 m/s,</td></tr>
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<table>
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<tr><td></td><td></td><td>
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<tr><td></td><td></td><td>Low level: 2.5 m/s</td></tr>
<tr><td></td><td>O</td><td>0.5 m/s</td></tr>
<tr><td>Derived Motion Winds: Hemispheric</td><td>T</td><td>High level: 6 m/s, Mid level 4 m/s, Low level: 2.5 m/s</td></tr>
<tr><td></td><td>O</td><td>0.5 m/s</td></tr>
<tr><td>Derived Motion Winds: Mesoscale</td><td>T</td><td>High level: 6 m/s, Mid level 4 m/s, Low level: 2.5 m/s</td></tr>
<tr><td></td><td>O</td><td>0.5 m/s</td></tr>
<tr><td>Microburst Windspeed Potential</td><td>T</td><td>TBD</td></tr>
<tr><td></td><td>O</td><td>TBD</td></tr>
</table>
</td></tr>
<tr><td>6862</td><td>The mission criticality values are included in the four product criticality tables below shall be met by the GOES-R system. The T and O listed in the table note the Threshold and Goal values. Values of 1 are considered mission critical products, while values of 2 are considered mission enhancing. Value of three indicate a lower priority to the mission while 3' indicates critical product to an agency outside of NOAA for other missions.</td><td></td></tr>
<tr><td>6863</td><td>
<table>
<tr><td>Observational Requirement</td><td>LEV</td><td>Product Criticality</td></tr>
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<tr><td></td><td>EL</td><td></td></tr>
<tr><td><i>AEROSOLS</i></td><td></td><td></td></tr>
<tr><td>Aerosol Detection: CONUS (including Smoke and Dust)</td><td>T</td><td>1</td></tr>
<tr><td></td><td>O</td><td>1</td></tr>
<tr><td>Aerosol Detection: Hemispheric (including Smoke and Dust)</td><td>T</td><td>1</td></tr>
<tr><td></td><td>O</td><td>1</td></tr>
<tr><td>Aerosol Detection: Mesoscale (including Smoke and Dust)</td><td>T</td><td>1</td></tr>
<tr><td></td><td>O</td><td>1</td></tr>
<tr><td>Aerosol Particle Size</td><td>T</td><td>1</td></tr>
<tr><td></td><td>O</td><td>1</td></tr>
<tr><td>Dust/Aerosol: Loading: CONUS</td><td>T</td><td>2</td></tr>
<tr><td></td><td>O</td><td>2</td></tr>
<tr><td>Dust/Aerosol: Loading: Hemispheric</td><td>T</td><td>3</td></tr>
<tr><td></td><td>O</td><td>3</td></tr>
<tr><td>Suspended Matter / Optical Depth: CONUS</td><td>T</td><td>1</td></tr>
<tr><td></td><td>O</td><td>1</td></tr>
<tr><td>Suspended Matter / Optical Depth: Hemispheric</td><td>T</td><td>1</td></tr>
<tr><td></td><td>O</td><td>1</td></tr>
<tr><td>Volcanic Ash: Detection and Height</td><td>T</td><td>1</td></tr>
<tr><td></td><td>O</td><td>1</td></tr>
<tr><td><i>CLOUDS</i></td><td></td><td></td></tr>
<tr><td>Aircraft Icing Threat</td><td>T</td><td>3</td></tr>
<tr><td></td><td>O</td><td>3</td></tr>
<tr><td>Cloud Base Height: CONUS</td><td>T</td><td>1</td></tr>
</table>
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</table>

ID	NOAA’s Mission Requirements Document 2B (MRD-2B) for the GOES-R Series	Text On Jan27 (MRD-2B draft)

	O	1
Cloud Base Height: Hemispheric	T	1
	O	1
Cloud Base Height: Mesoscale	T	1
	O	1
Cloud Ice Water Path: CONUS	T	2
	O	2
Cloud Ice Water Path: Hemispheric	T	1
	O	1
Cloud Ice Water Path: Mesoscale	T	2
	O	2
Cloud Imagery: Coastal	T	2
	O	2
Cloud Layers/ Heights and Thickness: CONUS	T	3
	O	3
Cloud Layers/ Heights and Thickness: Hemispheric	T	1
	O	1
Cloud Layers/ Heights and Thickness: Mesoscale	T	3'
	O	3
Cloud Liquid Water: CONUS	T	3
	O	3
Cloud Liquid Water: Hemispheric	T	1
	O 1	
Cloud Liquid Water: Mesoscale	T	1

<table>
<tr><th>ID</th><th>NOAA’s Mission Requirements Document 2B (MRD-2B) for the GOES-R Series</th><th>Text On Jan27 (MRD-2B draft)</th></tr>
<tr><td></td><td>
<table>
<tr><td></td><td>O
1</td><td></td></tr>
<tr><td>Cloud & Moisture Imagery: CONUS</td><td>T</td><td>1</td></tr>
<tr><td></td><td>O</td><td>1</td></tr>
<tr><td>Cloud & Moisture Imagery: Hemispheric</td><td>T</td><td>1</td></tr>
<tr><td></td><td>O</td><td>1</td></tr>
<tr><td>Cloud & Moisture Imagery: Mesoscale</td><td>T</td><td>1</td></tr>
<tr><td></td><td>O</td><td>1</td></tr>
<tr><td>Cloud Optical Depth: CONUS</td><td>T</td><td>3</td></tr>
<tr><td></td><td>O</td><td>3</td></tr>
<tr><td>Cloud Optical Depth: Hemispheric</td><td>T</td><td>1</td></tr>
<tr><td></td><td>O</td><td>1</td></tr>
<tr><td>Cloud Particle Size Distribution: CONUS</td><td>T</td><td>2</td></tr>
<tr><td></td><td>O</td><td>2</td></tr>
<tr><td>Cloud Particle Size Distribution: Hemispheric</td><td>T</td><td>1</td></tr>
<tr><td></td><td>O</td><td>1</td></tr>
<tr><td>Cloud Particle Size Distribution: Mesoscale</td><td>T</td><td>2</td></tr>
<tr><td></td><td>O</td><td>2</td></tr>
<tr><td>Cloud Top Phase: CONUS</td><td>T</td><td>2</td></tr>
<tr><td></td><td>O</td><td>2</td></tr>
<tr><td>Cloud Top Phase: Hemispheric</td><td>T</td><td>1</td></tr>
<tr><td></td><td>O</td><td>1</td></tr>
<tr><td>Cloud Top Phase: Mesoscale</td><td>T</td><td>2</td></tr>
<tr><td></td><td>O</td><td>2</td></tr>
<tr><td>Cloud Top Height: CONUS</td><td>T</td><td>2</td></tr>
</table>
</td><td></td></tr>
</table>

ID	NOAA's Mission Requirements Document 2B (MRD-2B) for the GOES-R Series			Text On Jan27 (MRD-2B draft)
		O	2	
	Cloud Top Height: Hemispheric	T	1	
		O	1	
	Cloud Top Height: Mesoscale	T 1		
		O	1	
	Cloud Top Pressure: CONUS	T	2	
		O	2	
	Cloud Top Pressure: Hemispheric	T	1	
		O	1	
	Cloud Top Temperature: Hemispheric	T	2	
		O 2		
	Cloud Top Temperature: Mesoscale	T	3	
		O	3	
	Cloud Type: CONUS	T	1	
		O	1	
	Cloud Type: Hemispheric	T	1	
		O	1	
	Cloud Type: Mesoscale	T	3'	
		O	3	
	Convective Initiation	T	1	
		O	1	
	Enhanced "V"/Overshooting Top Detection: CONUS	T	1	
		O	1	
	Enhanced "V"/Overshooting Top Detection: Mesoscale	T	2	

<table>
<tr><th>ID</th><th>NOAA’s Mission Requirements Document 2B (MRD-2B) for the GOES-R Series</th><th>Text On Jan27 (MRD-2B draft)</th></tr>
<tr><td></td><td>
<table>
<tr><td></td><td>O</td><td>2</td></tr>
<tr><td>Hurricane Intensity</td><td>T</td><td>1</td></tr>
<tr><td></td><td>O</td><td>1</td></tr>
<tr><td>Imagery: All-Weather/Day-Night: Hemis</td><td>T</td><td>3'</td></tr>
<tr><td></td><td>O</td><td>1</td></tr>
<tr><td>Lightning Detection: CONUS</td><td>T</td><td>1</td></tr>
<tr><td></td><td>O</td><td>1</td></tr>
<tr><td>Lightning Detection: Hemispheric</td><td>T</td><td>1</td></tr>
<tr><td></td><td>O</td><td>1</td></tr>
<tr><td>Lightning Detection: Mesoscale</td><td>T</td><td>1</td></tr>
<tr><td></td><td>O</td><td>1</td></tr>
<tr><td>Low Cloud and Fog</td><td>T</td><td>1</td></tr>
<tr><td></td><td>O</td><td>1</td></tr>
<tr><td>Turbulence: Hemispheric</td><td>T</td><td>1</td></tr>
<tr><td></td><td>O</td><td>1</td></tr>
<tr><td>Turbulence: Mesoscale</td><td>T</td><td>3</td></tr>
<tr><td></td><td>O</td><td>3</td></tr>
<tr><td>Visibility: Coastal</td><td>T</td><td>2</td></tr>
<tr><td></td><td>O</td><td>2</td></tr>
<tr><td>Visibility: Hemispheric</td><td>T</td><td>1</td></tr>
<tr><td></td><td>O</td><td>1</td></tr>
<tr><td><i>PRECIPITATION</i></td><td></td><td></td></tr>
<tr><td>Probability of Rainfall</td><td>T</td><td>1</td></tr>
<tr><td></td><td>O</td><td>1</td></tr>
<tr><td>Rainfall Potential</td><td>T</td><td>1</td></tr>
<tr><td></td><td>O</td><td>1</td></tr>
<tr><td>Rainfall Rate/QPE</td><td>T</td><td>1</td></tr>
<tr><td></td><td>O</td><td>1</td></tr>
<tr><td>PROFILES</td><td></td><td></td></tr>
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</table>

ID	NOAA's Mission Requirements Document 2B (MRD-2B) for the GOES-R Series			Text On Jan27 (MRD-2B draft)
	Atmospheric Vertical Moisture Profile: CONUS	T	1	
		O	1	
	Atmospheric Vertical Moisture Profile: Hemispheric	T	1	
		O	1	
	Atmospheric Vertical Moisture Profile: Mesoscale	T	1	
		O	1	
	Atmospheric Vertical Temperature Profile: CONUS	T	1	
		O	1	
	Atmospheric Vertical Temperature Profile: Hemispheric	T	1	
		O	1	
	Atmospheric Vertical Temperature Profile: Mesoscale	T	1	
		O	1	
	Capping Inversion Information: CONUS	T	1	
		O	1	
	Capping Inversion Information: Mesoscale	T	1	
		O	1	
	Derived Stability Indices: CONUS	T	1	
		O	1	
	Derived Stability Indices: Mesoscale	T	1	
		O	1	
	Moisture Flux: CONUS	T	1	
		O	1	

ID	NOAA's Mission Requirements Document 2B (MRD-2B) for the GOES-R Series			Text On Jan27 (MRD-2B draft)
	Moisture Flux: Hemispheric	T	1	
		O	1	
	Moisture Flux: Mesoscale	T	1	
		O	1	
	Pressure Profile: Mesoscale	T	3'	
		O	1	
	Total Precipitable Water: Hemispheric	T	1	
		O	1	
	Total Water Content: CONUS	T	1	
		O	1	
	Total Water Content: Hemispheric	T	1	
		O	1	
	Total Water Content: Mesoscale	T	1	
		O	1	
	RADIANCES			
	Clear Sky Masks: CONUS	T	3	
		O	3	
	Clear Sky Masks: Hemispheric	T	3	
		O	3	
	Clear Sky Masks: Mesoscale	T	3	
		O	3	
	Radiances: CONUS	T	1	
		O	1	
	Radiances: Hemispheric	T	1	
		O	1	
	Radiances: Mesoscale	T	1	
		O	1	
	RADIATION			
	Absorbed Shortwave Radiation: Surface/ Mesoscale	T	1	

ID	**NOAA's Mission Requirements Document 2B (MRD-2B) for the GOES-R Series**			**Text On Jan27 (MRD-2B draft)**
		O	1	
	Downward Longwave Radiation: Surface/CONUS	T	2	
		O	1	
	Downward Longwave Radiation: Surface/Hemispheric	T	1	
		O	1	
	Downward Solar Insolation: Surface/ CONUS	T	2	
		O	2	
	Downward Solar Insolation: Surface/ Hemispheric	T	1	
		O	1	
	Downward Solar Insolation: Surface/ Mesoscale	T	1	
		O	1	
	Reflected Solar Insolation: TOA / CONUS	T	2	
		O	2	
	Reflected Solar Insolation: TOA / Hemispheric	T 1		
		O	1	
	Upward Longwave Radiation: Surface/CONUS	T	2	
		O	2	
	Upward Longwave Radiation: Surface/Hemispheric	T	1	
		O	1	
	Upward Longwave Radiation: TOA/	T	2	

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<table>
<tr><td>CONUS</td><td></td><td></td></tr>
<tr><td></td><td>O</td><td>2</td></tr>
<tr><td>Upward Longwave Radiation: TOA/ Hemispheric T 1</td><td></td><td></td></tr>
<tr><td></td><td>O</td><td>1</td></tr>
<tr><td>TRACE GASES</td><td></td><td></td></tr>
<tr><td>CO Concentration</td><td>T</td><td>3</td></tr>
<tr><td></td><td>O</td><td>3</td></tr>
<tr><td>Removed</td><td></td><td></td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td>Removed</td><td></td><td></td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td>Ozone Total: CONUS</td><td>T</td><td>3</td></tr>
<tr><td></td><td>O</td><td>3</td></tr>
<tr><td>Ozone Total: Hemispheric</td><td>T</td><td>2</td></tr>
<tr><td></td><td>O</td><td>2</td></tr>
<tr><td>SO_2 Detection</td><td>T</td><td>3</td></tr>
<tr><td></td><td>O</td><td>3</td></tr>
<tr><td>WINDS</td><td></td><td></td></tr>
<tr><td>Derived Motion Winds: CONUS</td><td>T</td><td>1</td></tr>
<tr><td></td><td>O</td><td>1</td></tr>
<tr><td>Derived Motion Winds: Hemispheric</td><td>T</td><td>1</td></tr>
<tr><td></td><td>O</td><td>1</td></tr>
<tr><td>Derived Motion Winds: Mesoscale</td><td>T</td><td>1</td></tr>
<tr><td></td><td>O</td><td>1</td></tr>
<tr><td>Microburst Windspeed Potential</td><td>T</td><td>1</td></tr>
<tr><td></td><td>O</td><td>1</td></tr>
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<tr><td>6864</td><td colspan="2">
<table>
<tr><td>Observational Requirement <i>LAND</i></td><td>LEVEL</td><td>Product Criticality</td><td></td></tr>
<tr><td>Fire / Hot Spot Imagery: CONUS</td><td>T</td><td>1</td><td></td></tr>
<tr><td></td><td>O</td><td>1</td><td></td></tr>
<tr><td>Fire / Hot Spot Imagery: Hemispheric</td><td>T</td><td>1</td><td></td></tr>
<tr><td></td><td>O</td><td>1</td><td></td></tr>
<tr><td>Flood/Standing Water: Hemispheric</td><td>T</td><td>2</td><td></td></tr>
<tr><td></td><td>O</td><td>2</td><td></td></tr>
<tr><td>Flood/Standing Water: Mesoscale</td><td>T</td><td>2</td><td></td></tr>
<tr><td></td><td>O</td><td>2</td><td></td></tr>
<tr><td>Ice Cover/ Landlocked: Hemispheric</td><td>T</td><td>3'</td><td></td></tr>
<tr><td></td><td>O</td><td>3</td><td></td></tr>
<tr><td>Land Surface (Skin) Temperature: CONUS</td><td>T</td><td>2</td><td></td></tr>
<tr><td></td><td>O</td><td>2</td><td></td></tr>
<tr><td>Land Surface (Skin) Temperature: Hemispheric</td><td>T</td><td>2</td><td></td></tr>
<tr><td></td><td>O</td><td>2</td><td></td></tr>
<tr><td>Land Surface (Skin) Temperature: Mesoscale</td><td>T</td><td>1</td><td></td></tr>
<tr><td></td><td>O</td><td>1</td><td></td></tr>
<tr><td>Snow Cover: CONUS</td><td>T</td><td>1</td><td></td></tr>
<tr><td></td><td>O</td><td>1</td><td></td></tr>
<tr><td>Snow Cover: Hemispheric</td><td>T</td><td>1</td><td></td></tr>
<tr><td></td><td>O</td><td>1</td><td></td></tr>
<tr><td>Snow Cover: Mesoscale</td><td>T</td><td>3'</td><td></td></tr>
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<tr><td></td><td>
<table>
<tr><td></td><td>O</td><td>3</td><td></td></tr>
<tr><td>Snow Depth: CONUS</td><td>T</td><td>1</td><td></td></tr>
<tr><td></td><td>O</td><td>1</td><td></td></tr>
<tr><td>Snow Depth: Hemispheric</td><td>T</td><td>1</td><td></td></tr>
<tr><td></td><td>O</td><td>1</td><td></td></tr>
<tr><td>Snow Depth: Mesoscale</td><td>T</td><td>3</td><td></td></tr>
<tr><td></td><td>O</td><td>3</td><td></td></tr>
<tr><td>Surface Albedo: Hemispheric</td><td>T</td><td>3'</td><td></td></tr>
<tr><td></td><td>O</td><td>3</td><td></td></tr>
<tr><td>Surface Emissivity</td><td>T</td><td>2</td><td></td></tr>
<tr><td></td><td>O</td><td>2</td><td></td></tr>
<tr><td>Vegetation Fraction: Green</td><td>T</td><td>2</td><td></td></tr>
<tr><td></td><td>O</td><td>2</td><td></td></tr>
<tr><td>Vegetation Index: CONUS</td><td>T</td><td>2</td><td></td></tr>
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<tr><td>6865</td><td>
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<tr><td>Observational Requirement <i>OCEAN</i></td><td>LEVEL</td><td>Product Criticality</td></tr>
<tr><td>Currents: Hemispheric</td><td>T</td><td>1</td></tr>
<tr><td></td><td>O</td><td>1</td></tr>
<tr><td>Currents: Mesoscale</td><td>T</td><td>1</td></tr>
<tr><td></td><td>O</td><td>1</td></tr>
<tr><td>Currents: Offshore / CONUS</td><td>T</td><td>1</td></tr>
<tr><td></td><td>O</td><td>1</td></tr>
<tr><td>Currents: Offshore / Hemispheric</td><td>T</td><td>3'</td></tr>
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	Ocean Color: Coastal (Turbidity/ Chlorophyll/ Reflectance)	T	1	
		O	1	
	Ocean Color: CONUS/Offshore (Turbidity/ Chlorophyll/ Reflectance)	T	1	
		O	1	
	Ocean Color: Offshore (Turbidity/ Chlorophyll/ Reflectance)	T	2	
		O	2	
	Ocean Turbidity: Hemispheric (Turbidity/Visibility)	T	3	
		O	3	
	Optical Properties: Coastal (partic. absrptn, bcksctter, fluores.)	T	2	
		O	2	
	Optical Properties: CONUS/Offshore (prtc. absrptn, bcksctr, fluores.)	T	2	
		O	2	
	Sea & Lake Ice: Age HEMISPHERIC	T	3	
		O	3	
	Sea & Lake Ice: Concentration: CONUS	T	3	
		O	3	
	Sea & Lake Ice: Concentration Hemispheric	T	1	
		O	1	
	Sea & Lake Ice: Displacement and Direction Hemispheric	T	3	
		O	3	

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<tr><td>Sea & Lake Ice: Extent and Characterization Hemispheric</td><td>T</td><td>2</td></tr>
<tr><td></td><td>O</td><td>2</td></tr>
<tr><td>Sea & Lake Ice: Motion CONUS</td><td>T</td><td>1</td></tr>
<tr><td></td><td>O</td><td>1</td></tr>
<tr><td>Sea & Lake Ice: Motion Hemispheric</td><td>T</td><td>1</td></tr>
<tr><td></td><td>O</td><td>1</td></tr>
<tr><td>Sea Surface Temps: CONUS/Offshore</td><td>T</td><td>1</td></tr>
<tr><td></td><td>O</td><td>1</td></tr>
<tr><td>Sea Surface Temps: Hemispheric</td><td>T</td><td>1</td></tr>
<tr><td></td><td>O</td><td>1</td></tr>
<tr><td>Sea Surface Temps: Mesoscale</td><td>T</td><td>1</td></tr>
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<tr><td>6866</td><td>
<table>
<tr><td>Observational Requirement *Space and Solar*</td><td>LEVEL</td><td>Product Criticality</td></tr>
<tr><td>*ENERGETIC PARTICLES*</td><td></td><td></td></tr>
<tr><td>Energetic Heavy Ions</td><td>T</td><td>1</td></tr>
<tr><td></td><td>O</td><td>1</td></tr>
<tr><td>Magnetospheric Electrons and Protons: Low Energy</td><td>T</td><td>1</td></tr>
<tr><td></td><td>O</td><td>1</td></tr>
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<table>
<tr><td>Magnetospheric Electrons and Protons: Medium & High Energy</td><td>T</td><td>1</td></tr>
<tr><td></td><td>O</td><td>1</td></tr>
<tr><td>Solar and Galactic Protons</td><td>T</td><td>1</td></tr>
<tr><td></td><td>O</td><td>1</td></tr>
<tr><td>MAGNETIC FIELD</td><td></td><td></td></tr>
<tr><td>Geomagnetic Field</td><td>T</td><td>1</td></tr>
<tr><td></td><td>O</td><td>1</td></tr>
<tr><td>SOLAR</td><td></td><td></td></tr>
<tr><td>Solar Flux: EUV</td><td>T</td><td>1</td></tr>
<tr><td></td><td>O</td><td>1</td></tr>
<tr><td>Solar Flux: X-Ray</td><td>T</td><td>1</td></tr>
<tr><td></td><td>O</td><td>1</td></tr>
<tr><td>Solar Imagery: X-Ray</td><td>T</td><td>1</td></tr>
<tr><td></td><td>O</td><td>1</td></tr>
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</td><td></td></tr>
<tr><td>6859</td><td>1.4.9 Mission Product Geo-location</td><td></td></tr>
<tr><td>6693</td><td>The mission shall meet, in conjunction with the related spacecraft and instruments error(s), the product requirement for pointing and mapping (geo-location) as defined for each instrument under section 2.10.</td><td>The mission will meet, in conjunction with the related spacecraft and instruments error(s), the product requirement for pointing and mapping as defined for each instrument under section 2.10.</td></tr>
<tr><td>1007</td><td>Discussion: It is important to note that the contractual documents delivered to the instrument vendors contained additional government margin in the areas of satellite mapping (Geo-location) and registration resources; the roadmap for this margin is specified in the Payload Resource Allocation Document.</td><td>The contractual documents delivered to the instrument vendors contained additional government margin in the areas of satellite mapping (Geo-location) and registration resources; the roadmap for this margin is specified in the Payload Resource Allocation Document.</td></tr>
<tr><td>950</td><td>1.4.10 Mission Continuity</td><td>1.4.9 Mission Continuity</td></tr>
</table>

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6593	**1.4.11 Mission Data Standards**	1.4.10 Mission Data Standards
6594	The GOES-R system shall use CCSDS Grade of Service 2 for all telemetry streams of the instrument and spacecraft bus.	The GOES-R system shall use CCSDS Type 1 packetization and Grade 2 service for all telemetry streams of the instrument and spacecraft bus.
957	End-to-end validation and verification of each of the instruments shall be performed from each of the instrument inputs through the level 0 data.	End-to-end validation and verification of each of the instruments shall be performed from the signal input though the output of the downlink antennas.
958	Spacecraft end-to-end check-out tests shall be performed at the launch pad to demonstrate operational capabilities.	Spacecraft end-to-end check-out tests shall be performed at the launch pad to demonstrate full operational capabilities.
6405	Definition: Space and Launch Segment availability is the probability that the Space and Launch Segment can be successfully used for any specified mission over the stated period of time and is defined as the Mean Time Between Failure (MTBF) divided by the sum of the MTBF and the Mean Time To Repair (MTTR) (nominally uptime divided by the sum of the uptime and downtime). Planned operations will be scheduled routinely throughout the lifetime of the GOES-R series and will not count against the system availability; these include stationkeeping, satellite relocation of up to 30 days, any keep out zone periods, any yaw flips, and housekeeping that includes instrument calibration and momentum management. The average Space and Launch Segment availability of the Space and Launch Segment over the operational lifetime and over the coverage areas shall be 0.83 (THRESHOLD; GOAL 0.89) over the east and west coverage zones. (The east and west coverage zones lie outside of the central coverage zone for either primary instrument located in a central operating position).	Definition: Space and Launch Segment availability is the probability that the Space and Launch Segment can be successfully used for any specified mission over the stated period of time and is defined as the Mean Time Between Failure (MTBF) divided by the sum of the MTBF and the Mean Time To Repair (MTTR) (nominally uptime divided by the sum of the uptime and downtime). Planned operations will be scheduled routinely throughout the lifetime of the GOES-R series and will not count against the system availability; these include stationkeeping, satellite relocation of up to 30 days, any keep out zone periods, any yaw flips, and housekeeping that includes instrument calibration and momentum management. The average Space and Launch Segment availability of the Space and Launch Segment over the operational lifetime and over the coverage areas shall be 0.83 (THRESHOLD; GOAL 0.89) over the east and west coverage zones. (The east and west coverage zones lie outside of the central coverage zone for either primary instrument located in a central operating position).

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	The average minimum Space and Launch Segment availability on a monthly basis shall be no smaller than 0.83. The Space and Launch Segment availability for data over CONUS shall be 0.99. *Discussion: The Space and Launch Segment availability is the major contributor to total mission availability.*	The average minimum Space and Launch Segment availability on a monthly basis shall be no smaller than 0.83. The Space and Launch Segment availability for data over CONUS shall be 0.99. Discussion: The Space and Launch Segment availability is the major contributor to total mission availability.
977	Definition: There will be multiple satellites in the GOES constellation. A satellite consists of a spacecraft to support the instruments, the associated communication systems, and the communications payload services. Two primary constellation architectures that are being considered are the consolidated architecture and the distributed architecture, although other architectures with other names that meet the requirements of the MRD are not excluded. The consolidated architecture uses two satellites, which is similar to the architecture for the current GOES. A distributed architecture consists of two or more satellites at each operational location, providing the same functions as a single consolidated satellite. The consolidated architecture supplies all payloads in a single satellite whereas the distributed architecture distributes the payloads across several satellites. For reference, the consolidated architecture has the same architecture as the GOES I-P series; the distributed architecture may have more than one satellite at each operational orbital location.	Definition: There will be multiple satellites in the GOES constellation. A satellite consists of a spacecraft to hold the instruments, the associated communications systems, and the communications payload services. The consolidated architecture uses two satellites, which is similar to the architecture for the current GOES. A distributed architecture consists of two or more satellites at each operational location, providing the same functions as a single consolidated satellite. The consolidated architecture supplies all payloads in a single satellite whereas the distributed architecture distributes the payloads across several satellites. For reference, the consolidated architecture has the same architecture as the GOES I-P series, the distributed architecture may have more than one satellite at each operational orbital location. Discussion: Several satellite architectures, and thus constellation architectures, are under consideration. Two primary architectures that are being considered are the consolidated architecture and the distributed architecture, although other architectures with other names that meet the requirements of the MRD are not excluded.

ID	**NOAA’s Mission Requirements Document 2B (MRD-2B) for the GOES-R Series**	**Text On Jan27 (MRD-2B draft)**
981	If there is a centrally located geostationary operational satellite, it will be operated from 105-degrees West (TBS). *Discussion: If an operational satellite is implemented as part of P^3I or if there is one unpaired operational primary instrument, the satellite with that primary instrument will be located at the central position of nominally 105-degrees West.*	If there is a centrally located geostationary operational satellite, it will be operated from 105-degrees West (TBS). *Discussion:* If an operational satellite is implemented as part of P3I or if there is one unpaired operational primary instrument, the satellite with that primary instrument will be located at the central position of nominally 105-degrees West .
982	On-orbit spare satellites (see section 2.4.3), will be stored at the 105-degrees West (TBS) orbital location. . *Discussion: On-orbit testing prior to operations will be conducted from another central locations, nominally 90 degrees West.*	On-orbit spare satellites (see section 2.4.3), will be stored at the 105-degrees West (TBS) orbital location. . Discussion: On-orbit testing prior to operations will be conducted from another central locations, nominally 90 degrees West.
990	The location of each satellite in the constellations shall be controlled to within +/-0.5 degree (TBR) (THRESHOLD) and 0.05 degree (GOAL) in latitude and longitude at the equator.	The location of each satellite in the constellations shall be controlled to within +/-0.5 degrees (TBR) in latitude and longitude at the equator; a smaller orbital box size is under discussion.
999	For a distributed architecture, the satellite (bus plus instruments) shall be designed for at least an 8.25 year Mean Mission Duration (MMD) after 10 years. For a consolidated architecture, the satellite (bus plus instruments) shall be designed for at least a 7 year Mean Mission Duration (MMD) after 10 years. For another type of architecture, the MMD shall be TBD after 10 years. Definition: The MMD is the integrated area under the reliability versus time curve from t = 5 years to t = 15 years, divided by the	For a distributed architecture, the satellite (bus plus instruments) shall be designed for at least an 8.25 year Mean Mission Duration (MMD) after 10 years. For a consolidated architecture, the satellite (bus plus instruments) shall be designed for at least a 7 year Mean Mission Duration (MMD) after 10 years. For another type of architecture, the MMD shall be TBD after 10 years. Definition: The MMD is the integrated area under the reliability versus time curve from t = 5 years to t = 15 years, divided by the

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	reliability estimated at 5 years. MMD applies after all storage (ground and on-orbit) and after launch discussed in section 2.4.3. This operational requirement shall be met after 5 years of ground storage and 5 years on on-orbit storage. The on-orbit storage degradation for the satellites (bus plus instruments) is TBD and must be included to meet the MMD specification. *Discussion: This means that the satellite, including instruments, will provide 10-year satellite on-life with satellite reliability of 0.54 at end of life for the distributed architecture and 0.34 for the consolidated architecture. (On-life simply means that the satellite will be operating for a period of 10 years with a reliability of 0.6 at the 10-year point.) This follows the on-orbit storage time and ground storage time discussed in section 2.4.3. As detailed for the HES and ABI, a 10-year instrument-on life will be supported with Instrument Reliability (R) of 0.6, based on a spacecraft Reliability of >/= 0.90 at 10 years.*	reliability estimated at 5 years. MMD applies after all storage (ground and on-orbit) and after launch discussed in section 2.4.3. This operational requirement shall be met after 5 years of ground storage and 5 years on on-orbit storage. The on-orbit storage degradation for the satellites (bus plus instruments) is TBD and must be included to meet the MMD specification. *Discussion: This means that the satellite, including instruments, will provide 10-year satellite on-life with satellite reliability of 0.54 at end of life for the distributed architecture and 0.34 for the consolidated architecture. (On-life simply means that the satellite will be operating for a period of 10 years with a reliability of 0.6 at the 10-year point.) This follows the on-orbit storage time and ground storage time discussed in section 2.4.3. As detailed for the HES and ABI, a 10-year instrument-on life will be supported with Instrument Reliability (R) of 0.6, based on a spacecraft Reliability of >/= 0.90 at 10 years.*
1004	Replacement of the satellite shall occur to support the mission availability requirement. Definition: To prevent a mission failure, either a spare satellite will be moved into place to provide the needed coverage or an existing operational satellite will be repositioned to provide the needed coverage. If a satellite fails with no on-orbit spare this may result	Replacement of the satellite shall occur to support the mission availability requirement. Definition: To prevent a mission failure, either a spare satellite will be moved into place to provide the needed coverage or an existing operational satellite will be repositioned to provide the needed coverage. If a satellite fails with no on-orbit spare this may result in

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	in a period of degraded performance until a replacement satellite is launched. Prior to this launch of the replacement, the system is operating in a degraded mode. *Discussion: For planning purposes, the launch queue for a new satellite should be anticipated to be 1 year.* *Discussion: At a minimum, degraded modes are mode 1, which consists of a HES in the central location and an ABI at each of the west and east locations, and mode 2 which consists of an ABI in the central location and a HES at each of the west and east locations.*	a period of degraded performance until a replacement satellite is launched. Prior to this launch of the replacement, the system is operating in a degraded mode. Discussion: For planning purposes, the launch queue for a new satellite should be anticipated to be 1 year. Discussion: At a minimum, degraded modes are mode 1, which consists of a HES in the central location and an ABI at each of the west and east locations, and mode 2 which consists of an ABI in the central location and a HES at each of the west and east locations.
1005	Discussion: However, due to the need for ABI data, the failure of satellite flying the ABI will result in a repositioning of the functioning satellite flying the ABI to the nominal 105-degree West position. The remaining satellite(s) in the East and West positions will take over some of the imaging task by using the HES. The HES instrument must be capable of yielding image data at reduced spectral resolution to permit a backup of the ABI capabilities. The failure of a satellite flying the HES will result in a repositioning of the operating satellite flying the HES to the nominal 105-degree West position because the sounding capability cannot be easily backed up with another type of satellite.	Discussion: However, due to the need for ABI data, the failure of satellite flying the ABI will result in a repositioning of the functioning satellite flying the ABI to the nominal 105-degree West position. The remaining satellite(s) in the East and West positions will take over some of the imaging task by using the HES. The HES instrument must be capable of yielding image data at reduced spectral resolution to permit a backup of the ABI capabilities. The failure of a satellite flying the HES will result in a repositioning of the operating satellite flying the HES to the nominal 105-degree West position because the sounding capability cannot be easily backed up with another type of satellite.
6642	The flight software shall be capable of being uploaded in Computer Software Units (CSUs) and usable immediately after completion of the modified unit upload and verification.	The flight software shall be capable of being uploaded in Computer Software Units (CSUs) and usable immediately after completion of the modified unit upload.
6810	Activation of the modified CSUs shall not require completion of an upload of the entire flight software image.	
6822	The definition of instrument commands within the ground database shall not be dependent on physical memory addresses	

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	within the flight software.	
6820	The flight software shall be reloadable on-orbit without computer restart.	
6755	All flight software shall be developed with ANSI/ISO standard languages. Minimal use of processor-specific assembly language is permitted for certain low-level programs such as interrupt service routines and device drivers with government approval.	All flight software shall be comptable with the GIRD and the UIIDs.
6645	The following minimum software functions shall be available upon processor reset or reboot, either through bootstrap code in non-volatile memory or through processor hardware discrete commands: 1. Processor RAM loading 2. Processor RAM dumping 3. Initiation of an essential portion (TBD) of the software functions.	The following minimum software functions shall be available upon processor reset or reboot, either through bootstrap code in non-volatile memory (PROM, EEPROM, etc.) or through processor hardware discrete commands: 1. Processor RAM loading 2. Processor RAM dumping 3. Initiation of all or an essential portion of the software functions.
6647	Time-tagged event messages shall consist of all anomalous events and (TBD) system performance events.	These time-tagged event messages shall consist of all anomalous events and (TBD) system performance events.
6530	The spacecraft design shall support detection, isolation, and recovery capabilities for any single credible fault in the spacecraft bus to ensure the health and safety of the satellite.	The spacecraft design shall support detection, isolation, and recovery capabilities for any single fault in the spacecraft bus to ensure the health and safety of the satellite.
6527	The spacecraft **shall** be capable of the following 9 station location changes during its on-orbit life. a. From checkout location to an on-orbit storage location at a minimum of 1° shift/day (TBR) b. From the on-orbit storage location to the operational station location at a minimum of 1° shift/day (TBR) c. Three changes of operational station location while meeting the Attitude Control System pointing performance specifications listed below at a minimum of 1° shift/day (TBR) d. Two emergency relocations at a minimum of 3° shift/day	The spacecraft **shall** be capable of the following 9 station location changes during its on-orbit life. a. From checkout location to an on-orbit storage location at a minimum of 1° shift/day (TBR) b. From the on-orbit storage location to the operational station location at a minimum of 1° shift/day (TBR) c. Three changes of operational station location while meeting the Attitude Control System pointing performance specifications listed below at a minimum of 1° shift/day (TBR) d. Two emergency relocations at less than or equal to 3° shift/day

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	without functional performance degradation e. From operational station location to end-of-life longitude at a minimum of 1° shift/day (TBR) f. Boost from geostationary orbit at end-of-life longitude to end-of-life super-synchronous orbit with a perigee of no less than 300 km above geostationary altitude.	without functional performance degradation e. From operational station location to end-of-life longitude at a minimum of 1° shift/day (TBR) f. Boost from geostationary orbit at end-of-life longitude to end-of-life super-synchronous orbit with a perigee of no less than 300 km above geostationary altitude.
6532	**2.5.1.2 Fault Detection and Correction (FDC)**	2.5.1.2 Fault handling and recovery
6823	The FDC function shall monitor the status of the observatory and report anomalies to the ground.	
6824	FDC shall perform autonomous hardware reconfiguration only for cases where observatory survival is at risk; all other reconfigurations shall be ground commanded.	
6825	The spacecraft shall enable and disable individual FDC elements upon ground command.	
6535	The spacecraft shall have an autonomous operations capability which maintains the ability to provide real-time mission data without contact with the ground segment for a period of at least 7 (TBR) days (THRESHOLD) and with TBD days (GOAL).	The spacecraft shall have an autonomous operations capability which maintains the ability to provide real-time mission data without contact with the ground segment for a period of at least TBD days (Threshold) and with a (Goal) of TBD day.
1020	The spacecraft shall be capable of maintaining spacecraft and instrument health and safety without ground intervention.	The spacecraft shall be capable of maintaining spacecraft and instrument health and safety margins without ground intervention.
6617	The spacecraft shall autonomously determine its initial inertial attitude within 10 (TBR) minutes of acquiring a safe and stable attitude, without requiring prior attitude knowledge or attitude information from the ground.	The spacecraft shall autonomously determining its initial inertial attitude within 10 (TBR) minutes of acquiring a safe and stable attitude, without requiring prior attitude knowledge or attitude information from the ground.
6539	The spacecraft shall perform a biannual 180-degree yaw maneuver (hereinafter referred to as a "yaw flip") upon ground command, if chosen by the government. The yaw axis is the nadir-pointing axis	The spacecraft contractor **shall** provide the capability for the spacecraft to perform biannual flip of 180 degrees about the yaw axis at the choosing of the government where the yaw is defined as

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	of the spacecraft, such that the north face of the spacecraft points south.	the nadir-pointing axis, such that the north face of the spacecraft points south.
6605	The spacecraft design, including instrument layout, integration, test, ground handling, storage and transportation shall comply with the contamination requirements in the GIRD, UIIDs, and MAR.	The spacecraft design, including instrument layout, integration, test, ground handling, storage and transportation shall comply with the GIRD, the UIIDs, and MAR.
6545	The battery shall have sufficient capacity to operate the spacecraft through launch, transfer orbit, initial outgas, stationkeeping, housekeeping, storage, and end-of-life boost modes with 1 cell failure without exceeding a battery depth-of-discharge (DOD) of TBD% of the battery nameplate capacity, where battery nameplate capacity is the minimum 10°C battery capacity which the battery is required to have to have for the mission life.	The battery(s) shall be fully capable of performing its function throughout spacecraft launch modes, transfer orbit modes, on-orbit storage, operational lifetime (including initial outgas, stationkeeping, housekeeping, storage) and end-of-life boost modes, with no less than TBD depth of discharge.
6546	The battery(s) shall have sufficient capacity to operate the spacecraft, instruments, and raw data downlink, telemetry and command functions, and the payload services through all eclipses of up to 72 minutes of total duration, with a battery DOD not to exceed TBD % of the battery's nameplate capacity, and with no battery damage.	The battery(s) shall have sufficient capacity to operate the spacecraft, instruments, and raw data downlink, telemetry and command functions, and the payload services through all eclipses of up to 72 minutes of total duration.
1014	The spacecraft shall autonomously maintain on board timing consistent with the ground system, as per the GIRD.	The spacecraft shall autonomously maintain on board timing consistent within TBD microseconds with the ground system.
1018	The spacecraft shall provide a telemetry and command system to allow spacecraft stored command and real-time command control, tasking, software uploads, memory and table dumps, health and status verifications, command verifications, and anomaly resolution.	The spacecraft shall provide a telemetry and command system to allow spacecraft stored and real-time control, tasking, software uploads, health and status verifications, command verifications, and anomaly resolution.
4383	The GOES-R satellite shall support satellite telemetry and command.	The GOES-R satellite shall support telemetry and command of the spacecraft. This system interfaces with the terrestrial components described below:
6826	The GOES-R satellite system shall interface with the terrestrial components described below:	
4384	The NASA Deep Space Network (DSN), Tracking and Data Relay	The NASA Deep Space Network (DSN) or similar system: This

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	Satellite System (TDRSS), or similar system: This interface is the primary communication during the launch and orbit raising phases of the mission.	interface is the primary communication during the launch and orbit raising phases of the mission.
6607	The spacecraft command storage shall support absolute time commands and relative time sequences.	The spacecraft command storage shall be capable supporting absolute time commands and relative time sequences. Absolute time commands shall be sent from the on-board spacecraft processor to other components at prespecified times with a resolution of 1.0 second. Relative time sequences shall be sequences of commands, which can be sent from the on-board processor following a predefined sequence.
6807	Absolute time commands shall be sent from the on-board spacecraft processor to other components at prespecified times with a resolution of 1.0 second or less.	
6808	Relative time sequences shall be sequences of commands, which are sent from the on-board processor following a predefined sequence.	
6608	The spacecraft shall continuously collect and filter spacecraft and instrument health and safety telemetry data, including data via discrete interfaces.	The spacecraft shall provide the capability to continuously collect and filter spacecraft and instrument housekeeping data, including housekeeping data via discrete interfaces and generate a real time critical telemetry for transmission.
6809	The spacecraft shall generate real-time critical telemetry for transmission.	
6609	The spacecraft shall have the capability to send predetermined sequences of commands to the instrument based on predefined instrument health and safety telemetry data.	The spacecraft shall have the capability to send predetermined sequence of commands to the instrument based on instrument housekeeping telemetry.
6845	**2.5.1.9 Reserved**	
6614	***2.5.1.10.1 Orbit Determination***	2.5.1.10.9 Orbit Determination
6610	The threshold value for spacecraft position knowledge shall be 100 m (TBR) 3-sigma, in-track, cross-track, and radial. To afford	The threshold value for spacecraft position knowledge shall be 300 m 3-sigma, in-track, cross-track, and radial. To afford improved

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<tr><td></td><td>improved product performance however, the goal shall be the position knowledge accuracy of 75 (TBR) meters 3-sigma, in-track, cross-track, and radial.</td><td>product performance however, the goal shall be the position knowledge accuracy of 75 (TBR) meters 3-sigma, in-track, cross-track, and radial.</td></tr>
<tr><td>6613</td><td><i>2.5.1.10.2 Attitude Determination</i></td><td>2.5.1.10.8 Attitude Determination</td></tr>
<tr><td>6619</td><td><i>2.5.1.10.3 Attitude Control Accuracy</i></td><td>2.5.1.10.1 Attitude Control Accuracy</td></tr>
<tr><td>6748</td><td>Instrument Interface Attitude Control Requirements (TBR)
<table>
<tr><th></th><th colspan="3">Earth Pointed (urad), 3-sigma</th><th colspan="2">Sun Pointed (arcminutes), 3-sigma</th></tr>
<tr><th></th><th>ABI</th><th>HES</th><th>GLM</th><th>SIS (East-West)</th><th>SIS (North-South)</th></tr>
<tr><td>Threshold</td><td>+/-360</td><td>+/-360</td><td>+/-360</td><td>+/-4.3</td><td>+/-2.3</td></tr>
<tr><td>Goal</td><td>+/-270</td><td>+/-270</td><td>+/-270</td><td>+/-1.6</td><td>+/-1.6</td></tr>
</table>
<i>Discussion: The Threshold SIS pointing requirement for East-West incorporates a solar drift rate of 15 arcsec/sec for 20 seconds, for a total pointing error of 300 arcsec, if the Sun Pointing Platform motion is stopped. The SIS Threshold East-West pointing error requirement is +/-1.8 arcmin, 3-sigma, if the Sun Pointing Platform motion is not stopped.</i></td><td>Instrument Interface Attitude Control Requirements (TBR)
<table>
<tr><th></th><th colspan="3">Earth Pointed</th><th colspan="2">Sun Pointed</th></tr>
<tr><th></th><th>ABI urad</th><th>HES urad</th><th>GLM urad</th><th>SIS[1] urad</th><th>SIS[2] (urad)</th></tr>
<tr><td>Threshold</td><td>360</td><td>360</td><td>360</td><td>669</td><td>436</td></tr>
<tr><td>Goal</td><td>270</td><td>270</td><td>270</td><td>524</td><td>349</td></tr>
</table>
[1] SIS sun pointing error data available. [2] SIS sun pointing error data not available.</td></tr>
<tr><td>6621</td><td><i>2.5.1.10.4 Attitude Stability</i></td><td>2.5.1.10.2 Attitude Stability</td></tr>
<tr><td>6749</td><td>Instrument Interface Attitude Stability Requirements (TBR)</td><td>Instrument Interface Attitude Stability Requirements (TBR)
<table>
<tr><th>Earth Pointed</th><th>Sun Pointed</th></tr>
</table></td></tr>
</table>

<table>
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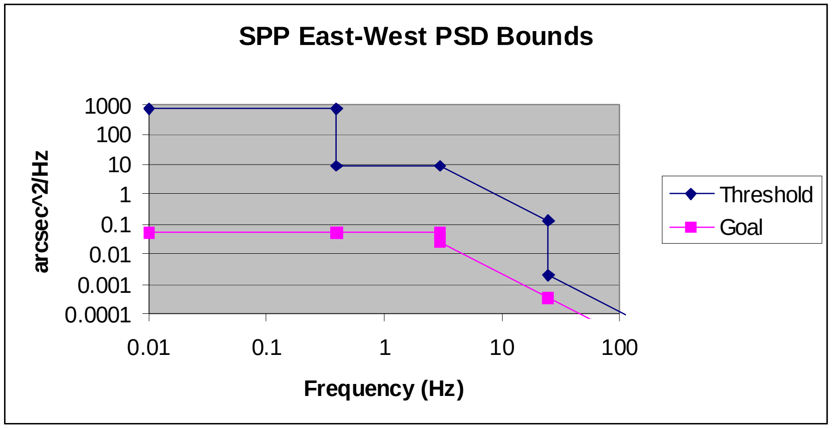
<tr><td></td><td>
<table>
<tr><td></td><td colspan="2">Earth Pointed, 3-sigma, Pk-pk</td><td colspan="3">Sun Pointed, 1-sigma; using 1-sided PSD below</td></tr>
<tr><td></td><td colspan="2">ABI HES GLM</td><td colspan="3"></td></tr>
<tr><td></td><td>Time (s)</td><td>Angle (urad)</td><td>Time (s)</td><td>E-W (arcsec)</td><td>N-S (arcsec)</td></tr>
<tr><td>Threshold</td><td>60</td><td>500</td><td>60</td><td>18.4</td><td>17.5</td></tr>
<tr><td>Goal</td><td>60</td><td>300</td><td>60</td><td>0.472</td><td>0.472</td></tr>
</table>
</td><td>
<table>
<tr><td></td><td colspan="2">ABI HES GLM</td><td colspan="2">SIS[1]</td></tr>
<tr><td></td><td>Time (s)</td><td>Angle urad</td><td>Time (s)</td><td>Angle urad</td></tr>
<tr><td>Threshold</td><td>60</td><td>500</td><td>60</td><td>484</td></tr>
<tr><td>Goal</td><td>60</td><td>300</td><td>60</td><td>291</td></tr>
</table>
[1] No exclusions.
</td></tr>
<tr><td>6846</td><td>


East-West PSD levels:

<table>
<tr><th>Frequency (Hz)</th><th>Threshold (arcsec^2/Hz)</th><th>Goal (arcsec^2/Hz)</th></tr>
<tr><td>0.01</td><td>750</td><td>0.05</td></tr>
<tr><td>0.4</td><td>750</td><td>0.05</td></tr>
<tr><td>0.4</td><td>9</td><td>0.05</td></tr>
<tr><td>3</td><td>9</td><td>0.05</td></tr>
<tr><td>3</td><td>9</td><td>0.0247</td></tr>
</table>
</td><td></td></tr>
</table>

<table>
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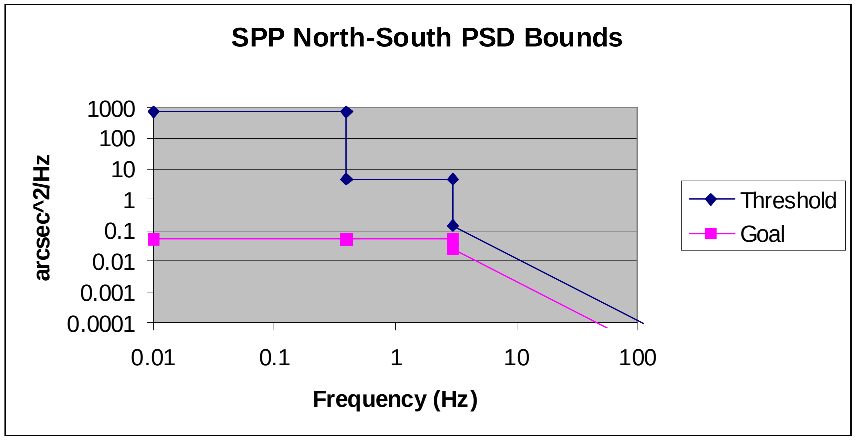
<tr><td></td><td><table><tr><td>25</td><td>0.13</td><td>0.00033</td></tr><tr><td>25</td><td>0.002</td><td>0.00033</td></tr><tr><td>400</td><td>7.8E-6</td><td>1.38E-6</td></tr></table></td><td></td></tr>
<tr><td>6847</td><td>

<p>North-South PSD levels:</p>
<table><tr><th>Frequency (Hz)</th><th>Threshold ($arcsec^2$/Hz)</th><th>Goal ($arcsec^2$/Hz)</th></tr><tr><td>0.01</td><td>750</td><td>0.05</td></tr><tr><td>0.4</td><td>750</td><td>0.05</td></tr><tr><td>0.4</td><td>9</td><td>0.05</td></tr><tr><td>3</td><td>9</td><td>0.05</td></tr><tr><td>3</td><td>9</td><td>0.0247</td></tr><tr><td>400</td><td>7.8E-6</td><td>1.38E-6</td></tr></table></td><td></td></tr>
<tr><td>6623</td><td><i>2.5.1.10.5 Attitude Error Rate</i></td><td>2.5.1.10.3 Attitude Error Rate</td></tr>
<tr><td>6625</td><td><i>2.5.1.10.6 Spacecraft Translational Acceleration</i></td><td>2.5.1.10.4 Spacecraft Translational Acceleration Limits</td></tr>
</table>

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	Limits	
6635	***2.5.1.10.7 Angular Displacement Sensor***	2.5.1.10.6 Angular Displacement Sensor
6629	***2.5.1.10.8 Momentum Management***	2.5.1.10.5 Momentum Management
6630	The spacecraft shall control the net angular momentum of the spacecraft and all mechanisms.	The spacecraft shall perform momentum compensation for the angular momentum accumulated from all external torques acting on the spacecraft.
6632	The spacecraft shall perform all computations and actuator selection logic required to perform the momentum management operation.	The spacecraft shall perform all computations and thruster selections required to perform the momentum management operation.
6827	In the case of a wheel failure, no wheel shall exceed one-half of its maximum rated speed during normal operation.	
6634	During normal operations, pointing control and knowledge requirements shall be relaxed for no more than one 10-minute period a day to accommodate momentum management operation. As a Goal, there shall be no pointing degradation during momentum management.	During normal operations, pointing control and knowledge requirements shall be relaxed for no more than one 10-minute period a day to accommodate momentum management. As a goal there should be no pointing degradation during momentum management.
6651	***2.5.1.10.9 Reserved***	2.5.1.10.7 Attitude Control System (ACS)
6637	***2.5.1.10.10 Reserved***	2.5.1.10.10 Propulsion
1024	The spacecraft shall have a Safe Hold Mode that supports both manual and autonomous operations that can be used in protecting the satellite from catastrophic failures and that can provide a means to return to normal operations.	The spacecraft shall have a Safe Hold mode that supports both manual and autonomous operations that can be used in protecting the satellite from catastrophic failures and that can provides a means to return to normal operations.

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		Definition: The safe hold mode is provide a thermally safe and power positive attitude, consistent with maintaining the health and safety of the spacecraft and instruments, and maintain a command and telemetry link with the ground for an indefinite period of time.
6829	In the Safe Hold Mode, the spacecraft shall provide, acquire, and indefinitely maintain an attitude state that is thermally safe power-positive, consistent with maintaining the health and safety of the spacecraft and instruments.	
6830	In the Safe Hold Mode, the spacecraft attitude and configuration shall support a command link and continuous telemetry link with the ground for an indefinite period of time.	
6668	Definition: Yield loads are limit loads multiplied by the appropriate protoflight yield factor of safety specified in NASA-STD-5001. For structural elements containing beryllium or beryllium alloys, the protoflight yield factor of safety is 1.4. The spacecraft structure shall support yield loads without detrimental permanent deformation.	Definition: Yield loads are limit loads multiplied by the appropriate protoflight yield factor of safety specified in NASA-STD-5001. The spacecraft structure shall support yield loads without detrimental permanent deformation.
6670	Definition: Ultimate loads are limit loads multiplied by the appropriate protoflight ultimate factor of safety specified in NASA-STD-5001. The structural elements containing beryllium or beryllium alloys, the protoflight ultimate factor of safety is 1.6. The spacecraft structures shall be able to support ultimate loads without fracture or collapse for at least 3 seconds including ultimate deflections and ultimate deformations of the flight unit structures and their boundaries. However, when proof of strength	The spacecraft structures shall be able to support ultimate loads without fracture or collapse for at least 3 seconds including ultimate deflections and ultimate deformations of the flight unit structures and their boundaries. However, when proof of strength is shown by dynamic tests simulating actual load conditions, the 3-second limit does not apply. Ultimate loads are limit loads multiplied by the appropriate protoflight ultimate factor of safety specified in NASA-STD-5001.

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	is shown by dynamic tests simulating actual load conditions, the 3-second limit does not apply.	
6550	**2.5.4.4 Spacecraft Storage**	2.5.1.9 Spacecraft Storage
6401	The spacecraft shall meet all requirements after being stored for up to 5 years on the ground and up to 5 years on orbit.	The spacecraft shall meet all requirements after being stored for 5 years on the ground and 5 years on orbit.
6831	**2.8.4 Instrument operation during on-orbit storage**	
6832	The spacecraft shall provide the capability to operate the SEISS and Magnetometer during on-orbit storage.	
1075	ABI will *contribute to* determinations of Suspended Matter / Optical Depth--CONUS in the atmosphere. ABI will provide total column coverage over the CONUS to meet 2 km spatial resolution, with Total Column vertical resolution, over the range of 0.0 - 3.0, with an accuracy of 0.05 for land and 0.03 for ocean, 5 min refresh rate, 1.0 km mapping accuracy, and 1 min data latency need. The following details the threshold requirement for the Aerosol Detection--CONUS: CONUS coverage, 2 km spatial resolution, with Total Column vertical resolution, over the range of 0.0 - 3.0, with an accuracy of 0.05 for land and 0.03 for ocean, 5 min refresh rate, 1.0 km mapping accuracy, and 1 min data latency.	ABI will *contribute to* determinations of Suspended Matter--CONUS in the atmosphere. ABI will provide total column coverage over the CONUS to meet 2 km spatial resolution, with Total Column vertical resolution, over the range of TBD, with an accuracy of TBD, 5 min refresh rate, 1.0 km mapping accuracy, and 1 min data latency need. The following details the threshold requirement for the Aerosol Detection--CONUS: CONUS coverage, 2 km spatial resolution, with Total Column vertical resolution, over the range of TBD, with an accuracy of TBD, 5 min refresh rate, 1.0 km mapping accuracy, and 1 min data latency.
1076	ABI will *contribute to* determinations of Suspended Matter / Optical Depth: Hemispheric in the atmosphere. ABI provides total column coverage over the full disk to meet 2 km spatial resolution, with Total Column vertical resolution, over the range of 0.0 - 3.0, with an accuracy of 0.05 for land and 0.03 for ocean, 15 min refresh rate, 1.0 km mapping accuracy, and 3 min data latency need. The following details the threshold requirement for the Suspended Matter-Hemispheric: full disk coverage, 2 km spatial resolution, with Total Column vertical resolution, over the range	ABI will *contribute to* determinations of Suspended Matter: Hemispheric in the atmosphere. ABI provides total column coverage over the full disk to meet 2 km spatial resolution, with Total Column vertical resolution, over the range of TBD, with an accuracy of TBD, 15 min refresh rate, 1.0 km mapping accuracy, and 3 min data latency need. The following details the threshold requirement for the Suspended Matter-Hemispheric: full disk coverage, 2 km spatial resolution, with Total Column vertical resolution, over the range of TBD, with an accuracy of TBD, 15

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	of 0.0 - 3.0, with an accuracy of 0.05 for land and 0.03 for ocean, 15 min refresh rate, 1.0 km mapping accuracy, and 3 min data latency.	min refresh rate, 1.0 km mapping accuracy, and 3 min data latency.
1163	ABI will contribute to determinations of the **Currents---Offshore/CONUS**. ABI will provide coverage over the CONUS and CONUS EEZ to address a threshold < 6 hours refresh; with n/a vertical resolution; with a 180 minute threshold latency; at 2 km threshold resolution by using the radiance values; using 1.0 km threshold mapping uncertainty; over the range of 0-5 m/s (0-18 km/hour); and with 2.0 m/s accuracy, and 60 minute latency. The following details the threshold requirement for the Currents---Offshore/CONUS over the CONUS and CONUS EEZ; with a threshold 6 hours refresh; with n/a vertical resolution; with a 180 minute threshold latency; at 2 km threshold resolution by using the radiance values; using 1.0 km threshold mapping uncertainty; over the range of 0-5 m/s (0-18 km/hour); and with 2.0 m/s accuracy, and 60 minute latency.	ABI will contribute to determinations of the Currents---Offshore/CONUS. ABI will provide coverage over the CONUS and CONUS EEZ to address a threshold < 6 hours refresh; with n/a vertical resolution; with a 180 minute threshold latency; at 2 km threshold resolution by using the radiance values; using 1.0 km threshold mapping uncertainty; over the range of 0-5 m/s (0-18 km/hour); and with 2.0 m/s accuracy, and 60 minute latency. The following details the threshold requirement for the Currents---Offshore/CONUS over the CONUS and CONUS EEZ; with a threshold 6 hours refresh; with n/a vertical resolution; with a 180 minute threshold latency; at 2 km threshold resolution by using the radiance values; using 1.0 km threshold mapping uncertainty; over the range of 0-5 m/s (0-18 km/hour); and with 2.0 m/s accuracy, and 60 minute latency.
1164	ABI will contribute to determinations of the **Currents--Offshore/Hemispheric.** ABI will provide coverage over the full disk to address TBD spatial resolution; with n/a vertical resolution; with a threshold TBD minute refresh; with a TBD minute threshold latency; at TBD km threshold resolution by using the radiance values; using TBD km threshold mapping uncertainty; and with +/- TBD accuracy. The following details the threshold requirement for the Currents--Hemispheric: over the full disk; with TBD spatial resolution; with n/a vertical resolution; with a threshold TBD minute refresh; with a TBD minute threshold latency; at TBD km threshold resolution by using the radiance values; using TBD km threshold mapping uncertainty; and with +/- TBD accuracy.	ABI will contribute to determinations of the Currents--Hemispheric. ABI will provide coverage over the full disk to address TBD spatial resolution; with n/a vertical resolution; with a threshold TBD minute refresh; with a TBD minute threshold latency; at TBD km threshold resolution by using the radiance values; using TBD km threshold mapping uncertainty; and with +/- TBD accuracy. The following details the threshold requirement for the Currents--Hemispheric: over the full disk; with TBD spatial resolution; with n/a vertical resolution; with a threshold TBD minute refresh; with a TBD minute threshold latency; at TBD km threshold resolution by using the radiance values; using TBD km threshold mapping uncertainty; and with +/- TBD accuracy.
1190	Discussion: Geostationary viewing geometry results in sunlight	Discussion: Geostationary viewing geometry results in sunlight

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	impingement on the optical path of the GOES imaging telescope during the periods of the year several weeks around each equinox. When this happens, stray sunlight may cause a degradation of the radiometric response accuracy of the imager's Earth-viewing detectors, as well as heating of the optical and structural elements of the instrument (e.g. the secondary mirror mounts). How much degradation and how long this effect lasts will depend on many design features of the imager. The imager should be designed in such a way that intrusion of sunlight from outside the field of view is minimized, reducing as much as is practical the need for "keep-out-zones" near local midnight during the equinoxes, and in addition minimize heating of secondary mirror and mount. Focused sunlight on the optics is a cause of potential damage. The energy is sufficient to damage optical materials and coatings, and to irreparably damage detectors. Within 3 degrees, it would not be useful to take data. The relaxation of requirements between 3 (5 degrees for 3.9 um) and 7.5 degrees (10 degrees for the low light channel) of the sun is done in recognition that stray light will contribute noise in the local midnight condition. These numbers are the result of formulation studies.	impingement on the optical path of the GOES imaging telescope during the periods of the year several weeks around each equinox. When this happens, stray sunlight may cause a degradation of the radiometric response accuracy of the imager's Earth-viewing detectors, as well as heating of the optical and structural elements of the instrument (e.g. the secondary mirror mounts). How much degradation and how long this effect lasts will depend on many design features of the imager. The imager should be designed in such a way that intrusion of sunlight from outside the field of view is minimized, reducing as much as is practical the need for "keep-out-zones" near local midnight during the equinoxes, and in addition minimize heating of secondary mirror and mount. Focused sunlight on the optics is a cause of potential damage. The energy is sufficient to damage optical materials and coatings, and to irreparably damage detectors. Within 3 degrees it would not be useful to take data. The relaxation of requirements between 3 (5 degrees for 3.9 um) and 7.5 degrees (10 degrees for the low light channel) of the sun is done in recognition that stray light will contribute noise in the local midnight condition. These numbers are the result of formulation studies.
1197	The imager shall be capable of acquiring data of a given area in both of the following time scales:	The imager shall be capable of acquiring data of a given area in both of the following time scales, although scan mode 4 is anticipated to be the normal operation mode:
1423	The instrument shall be designed for an 8.4 year Mean Mission Duration (MMD) at the end of 10 years. The MMD is the integrated area under the instrument reliability versus time curve from t = 5 years to t = 15 years, divided by the reliability estimated at 5 years. *Discussion: This mean that a 10-year instrument-on life will be supported with Reliability (R) of 0.6.*	The instrument shall be designed for an 8.4 year Mean Mission Duration (MMD) at the end of 10 years. The MMD is the integrated area under the instrument reliability versus time curve from t = 5 years to t = 15 years, divided by the reliability estimated at 5 years. *Discussion: This mean that a 10-year instrument-on life shall be supported with Reliability (R) of 0.6.*

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1424	Discussion: NOAA-NESDIS studied the benefits of extending the present lifetime of the current GOES series, as well as issues associated with extending the lifetime as a way to contain and reduce program costs. Given that new instruments are required to meet NOAA requirements as well as provide replacements and new designs, it was timely to look at the longer life. However, long life may be traded against the insertion of new capabilities and/or technologies. Major long lifetime issues would be: Avoiding single point failure designs, long life evaluation through accelerated lifetime testing of selected components such as mechanisms, thermal control of optics and electronics, analyses such as FMECA (Failure Mode, Effects and Criticality Analysis).	Discussion:’ NOAA-NESDIS studied the benefits of extending the present lifetime of the current GOES series, as well as issues associated with extending the lifetime as a way to contain and reduce program costs. Given that new instruments are required to meet NOAA requirements as well as provide replacements and new designs, it was timely to look at the longer life. However, long life may be traded against the insertion of new capabilities and/or technologies. Major long lifetime issues would be: Avoiding single point failure designs, long life evaluation through accelerated lifetime testing of selected components such as mechanisms, thermal control of optics and electronics, analyses such as FMECA (Failure Mode, Effects and Criticality Analysis).
1588	*Benefits:* The selection of bands has been optimized to meet all cloud, moisture, and surface observations requirements to support the NWS mission of weather and other forecasting. The phenomena observed and the critical applications are described by band:	*Benefits:* The selection of bands has been optimized to meet all cloud, moisture, and surface observations requirements to support the NWS mission of weather and other forecasting. The phenomena observed and the critical applications are described by band:
5885	The relative accuracy of each band shall be within the NEdN (1-sigma) for the following categories of relative error: a) swath to swath (where a swath is one traversal of the scan mirror in the east-west directions over the entire scene of interest), b) detector to detector, c) channel to channel, d) calibration to calibration. *Discussion: If the vendor exceeds this requirement, quantization of 1/3 of the NEdN is considered sufficient.*	The relative accuracy of each band shall be within the NEdN (1-sigma) for the following categories of relative error: a) swath to swath (where a swath is one traversal of the scan mirror in the east-west directions over the entire scene of interest), b) detector to detector, c) channel to channel, d) calibration to calibration. Discussion: If the vendor exceeds this requirement, quantization of 1/3 of the NED N is considered sufficient.
1733	Discussion: NOAA is aware that several requirements, notably in navigation and registration, are difficult to achieve by traditional means. Ground processing (see 3.C.1) will be required to meet	Discussion: NOAA is aware that several requirements, notably in navigation and registration, that are difficult to achieve by traditional means. Ground processing (see 3.C.1) will be required

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	these requirements. An oversampled IR ground sample distance, in both directions, is required to ensure radiometrically accurate 2-km resolution IR products (see 3.B.4). MIT-LL has looked at spatial sample rates necessary for accurate ground processing and found several potential benefits. A 1-km sample rate in the IR bands is close to the Nyquist frequency for the system MTF of Table 1 and the corresponding optics and detector sizes envisioned for ABI. Since the data are nearly Nyquist sampled, the imagery can be reconstructed to any sample spacing with little radiometric error.	to meet these requirements. An oversampled IR ground sample distance, in both directions, is required to ensure radiometrically accurate 2-km resolution IR products (see 3.B.4). MIT-LL has looked at spatial sample rates necessary for accurate ground processing and found several potential benefits. A 1-km sample rate in the IR bands is close to the Nyquist frequency for the system MTF of Table 1 and the corresponding optics and detector sizes envisioned for ABI. Since the data are nearly Nyquist sampled, the imagery can be reconstructed to any sample spacing with little radiometric error.
1736	Benefits: Accurate navigation on all images is essential to accurate forecast product generation at NOAA. Accurately navigated imagery allows trouble-free merger with other data sources, improved knowledge of the location of surface-based features and provides higher forecaster confidence in image interpretation, especially in applications demanding image animation.	Benefits: Accurate navigation on all images is essential to accurate forecast product generation at NOAA. Accurately navigated imagery allows trouble-free merger with other data sources, improved knowledge of the location of surface-based features and provides higher forecaster confidence in image interpretation, especially in applications demanding image animation.
1739	Discussion: Integrating geostationary imager data with other meteorological data, such as doppler radar (WSR-88D), numerical model output, and in situ observations from networks like ASOS, ACARS, and lightning detection sensors, is a critical capability of NWS forecast processes. Imager data format must be documented to allow for such integration.	Discussion: Integrating geostationary imager data with other meteorological data, such as doppler radar (WSR-88D), numerical model output, and in situ observations from networks like ASOS, ACARS, and lightning detection sensors, is a critical capability of NWS forecast processes. Imager data format must be documented to allow for such integration.
1740	Benefits: In addition to data fusion, this regular, orthogonal coordinate system allows for consistent estimations of feature sizes, distances, and motions.	Benefits: In addition to data fusion, this regular, orthogonal coordinate system allows for consistent estimations of feature sizes, distances and motions.
1747	Discussion: Co-registration error should be minimized the most for the important bands that can sense the rapidly changing surface (i.e. 8.5, 10.35, 11.2, 12.3, 13.3 µm). These co-registration errors reflect the results of vendor formulation studies and government review, but it is important to note that these are the pre-margining value.	Discussion: Co-registration error should be minimized the most for the important bands that can sense the rapidly changing surface (i.e. 8.5, 10.35, 11.2, 12.3, 13.3 µm). These co-registration errors reflect the results of vendor formulation studies and government review, but it is important to note that these are the pre-margining value.

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1780	Discussion: Focused sunlight on the optics is a cause of potential damage. The energy is sufficient to damage optical materials and coatings, and to irreparably damage detectors, especially the IR detectors. Two sources of damage have been identified. The first is operational imaging when the sun is in the field of regard. The keep out zone addresses this. The second is when the spacecraft goes off of sun and earth lock either for routine or unplanned maneuver.	Discussion: Focused sunlight on the optics is a cause of potential damage. The energy is sufficient to damage optical materials and coatings, and to irreparably damage detectors, especially the IR detectors. Two sources of damage have been identified. The first is operational imaging when the sun is in the field of regard. The keep out zone addresses this. The second is when the spacecraft goes off of sun and earth lock either for routine or unplanned maneuver.
1843	The change in the magnetic field of the instrument module associated with any instrument operation shall be less than 20 nT, peak to peak, in any axis when measured at a distance of 1 meter from any face of the scan mechanism. The change in the magnetic field of any other instrument module (e.g. power supply or electronics) associated with any instrument operation shall be less than 10 nT, peak to peak, in any axis when measured at a distance of 1 meter from any face of that module. *Discussion: Note that the total change for the entirety of ABI will be less than 30 nT. This need is driven by the magnetometer.*	The change in the magnetic field of the instrument module associated with any instrument operation shall be less than 20 nT, peak to peak, in any axis when measured at a distance of 1 meter from any face of the scan mechanism. The change in the magnetic field of any other instrument module (e.g. power supply or electronics) associated with any instrument operation shall be less than 10 nT, peak to peak, in any axis when measured at a distance of 1 meter from any face of that module. Discussion: Note that the total change for the entirety of ABI will be less than 30 nT. This need is driven by the magnetometer.
1941	NOAA expects that available technology should be used to design a Hyperspectral Environmental Suite that at a minimum meets this document's threshold requirements. Modularity in design should be considered where it permits introduction of improvements in successive units (i.e. GOES T or U) that may not be sufficiently mature to be included in beginning of the GOES-R series. Similarly, goal requirements that are not met initially by GOES-R may be implementable over a period either through planned improvements (including hardware and software) or though modularity. Critical performance parameters for the DS task of the HES are the scanning rates (i.e. spatial coverage), NEdN, and detector-optics ensquared energy. Critical performance parameters	NOAA expects that available technology should be used to design a Hyperspectral Environmental Suite that at a minimum meets this document's threshold requirements. Modularity in design should be considered where it permits introduction of improvements in successive units (i.e. GOES T or U) that may not be sufficiently mature to be included in beginning of the GOES-R series. Similarly, goal requirements that are not met initially by GOES-R may be implementable over a period either through pre-planned product improvement (P^3I) or though modularity. Critical performance parameters for the DS task of the HES are the scanning rates (i.e. spatial coverage), NEdN, and detector-optics ensquared energy. Critical performance parameters for the SW/M

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	for the SW/M task of the HES are the spatial resolution and the coverage rate. Critical performance parameters for the CW task of the HES are the spatial resolution and the spectral coverage. Critical performance parameters for the OO task of the HES are the spectral coverage.	task of the HES are the spatial resolution and the coverage rate. Critical performance parameters for the CW task of the HES are the spatial resolution and the spectral coverage. Critical performance parameters for the OO task of the HES are the spectral coverage.
2055	The daily period of time prior to and following spacecraft eclipse and during the seasonal periods just prior to and after eclipse when sunlight impinges on the HES optical path(s) is commonly called the keep-out-zone period. The translation of these time periods to angular space results in the description of the operational zone, the restricted performance zone and the keep-out zone. The HES shall meet all of its operational requirements for all detector elements greater than the THRESHOLD limits shown here from the center of the uneclipsed sun. The HES <u>should</u> meet all of its operational requirements for all pixels greater than the GOAL limits shown here from the center of the uneclipsed sun. Outside of this limit lies the operational zone.	The daily period of time prior to and following spacecraft eclipse and during the seasonal periods just prior to and after eclipse when sunlight impinges on the HES optical path(s) is commonly called the keep-out-zone period. The translation of these time periods to angular space results in the description of the operational zone, the restricted performance zone and the keep-out zone. The HES **shall** meet all of its operational requirements for all detector elements greater than the THRESHOLD limits shown here from the center of the uneclipsed sun. The HES <u>should</u> meet all of its operational requirements for all pixels greater than the GOAL limits shown here from the center of the uneclipsed sun. Outside of this limit lies the operational zone.
2067	57° (TBR)	10° (TBR)
2068	NA	5° (TBR)
2073	The restricted performance zone lies between the outer limit in the table above and the inner limit of the table below. The HES **shall** meet all requirements, except the NEdN and On-Orbit calibration and accuracy, for all detector elements for the Threshold limits between the outer limit in the table above and the inner limit of the table below, as measured from the center of the uneclipsed sun. The HES <u>should</u> meet all requirements, except the NEDN and On-Orbit calibration and accuracy, for all detector elements for the GOAL limits between the outer limit in the table above and the inner limit of the table below, as measured from the center of the	

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	uneclipsed sun.	
2085	NA	3° (TBR)
2086	NA	2° (TBR)
2089	NA	3° (TBR)
2090	NA	2° (TBR)
2091	Reflected solar (<3 microns) except for star sensing, are not applicable over the coverage area whenever any point on the coverage area falls within +/- 2.5 hours centered on local midnight. Thus reflected solar data (wavelengths less than 3 microns) are unconstrained during eclipse.	Reflected solar (<3 microns) except for star sensing, are not applicable over the coverage area whenever any point on the coverage area falls within +/- 2.5 hours centered on local midnight.
2098	Discussion: Geostationary viewing geometry results in sunlight impingement on the optical path of the GOES HES telescope(s) during the periods of the year several weeks around each equinox. When this happens, stray sunlight may cause a degradation of the radiometric response accuracy of the sounder's Earth-viewing detectors, as well as heating of the telescope(s). How much degradation and how long this effect lasts will depend on many design features of the HES. The HES should be designed in such a way that intrusion of sunlight from outside the field of view is minimized, reducing as much as is practical the need for "keep-out zones" near local midnight during the equinoxes, and in addition minimize heating of telescope(s) mirrors and mounts. Ground operations maintain a prohibition against scanning within 1.4 (TBR) degrees of the sun center under routine operating conditions to prevent HES instrument damage. Focused sunlight on the optics is a cause of potential damage. The energy is sufficient to damage optical materials and coatings, and to irreparably damage detectors. Any detector within 3 degrees of the sun (TBR) is not required to provide useful data. The relaxation of requirements between 3 (TBR) and 10 (TBR) degrees of the sun threshold	*Discussion:* Geostationary viewing geometry results in sunlight impingement on the optical path of the GOES HES telescope(s) during the periods of the year several weeks around each equinox. When this happens, stray sunlight may cause a degradation of the radiometric response accuracy of the sounder's Earth-viewing detectors, as well as heating of the telescope(s). How much degradation and how long this effect lasts will depend on many design features of the HES. The HES should be designed in such a way that intrusion of sunlight from outside the field of view is minimized, reducing as much as is practical the need for "keep-out zones" near local midnight during the equinoxes, and in addition minimize heating of telescope(s) mirrors and mounts. Ground operations maintain a prohibition against scanning within 1.4 (TBR) degrees of the sun center under routine operating conditions to prevent HES instrument damage. Focused sunlight on the optics is a cause of potential damage. The energy is sufficient to damage optical materials and coatings, and to irreparably damage detectors. Any detector within 3 degrees of the sun (TBR) is not required to provide useful data. The relaxation of requirements between 3 (TBR) and 10 (TBR) degrees of the sun threshold (between 2

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	(between 2 (TBR) and 5 (TBR) degrees goal) is done in recognition that stray light will degrade performance in the local midnight condition. A JPL February 2000 report ("Keep-Out Zone Specification for the Advanced Baseline Imager and Background Discussion,") has documented the initial numbers used in this requirement.	(TBR) and 5 (TBR) degrees goal) is done in recognition that stray light will degrade performance in the local midnight condition. A JPL February 2000 report ("Keep-Out Zone Specification for the Advanced Baseline Imager and Background Discussion,") has documented the initial numbers used in this requirement.
2130	ABI Backup mode (HES THRESHOLD across all tasks) (TBR): If ABI fails, HES must provide a backup, albeit with degraded capability compared to ABI. Images will be produced within a period of 30 minutes or less from the area of either the western or eastern full disk view that is not covered by a central full disk view (nominally 1.91e7 km^2 as shown in Figure 1a and known as the "wing" with a maximum width of 2806 km). The spatial resolution shall be no coarser that 4 km in the IR and 1 km in the visible. Soundings over the 62 degree LZA shall meet all requirements of the DS task (TBR) except the NEdN, which will be what the vendor can provide. "What the vendor can provide" shall include the subset of ABI band coverage in the visible band, reflected solar < 1 um (or reflective solar < 3 um), as well as the IR portion of the sounder (THRESHOLD). For soundings, the backup mode shall not preclude the usage of the SW/M task. The backup mode shall not preclude the usage of the HES-CW task. As a GOAL, the HES should provide, when imaging, the noise performance of the subset of ABI bands contained in the vendor's HES; and should provide for sounding the noise performance of 2*NEdN (TBR) of the DS task. (GOAL). *Discussion: HES-CW task will not typically be employed during the ABI backup mode, although use of the ABI backup mode will not preclude its usage for a special event.*	ABI Backup mode (HES THRESHOLD across all tasks) (TBR): If ABI fails, HES must provide a backup, albeit with degraded capability compared to ABI. Images will be produced within a period of 30 minutes or less from the area of either the western or eastern full disk view that is not covered by a central full disk view (nominally 1.91e7 km^2 as shown in Figure 1a and known as the "wing" with a maximum width of 2806 km). The spatial resolution shall be no coarser that 4 km in the IR and 1 km in the visible. Soundings over the 62 degree LZA shall meet all requirements of the DS task (TBR) except the NEdN, which will be what the vendor can provide. "What the vendor can provide" shall include the subset of ABI band coverage in the visible band, reflected solar < 1 um (or reflective solar < 3 um), as well as the IR portion of the sounder (THRESHOLD). For soundings, the backup mode shall not preclude the usage of the SW/M task. The backup mode shall not preclude the usage of the HES-CW task. As a GOAL, the HES should provide, when imaging, the noise performance of the subset of ABI bands contained in the vendor's HES; and should provide for sounding the noise performance of 2*NEdN (TBR) of the DS task. (GOAL). Discussion: HES-CW task will not typically be employed during the ABI backup mode, although use of the ABI backup mode will not preclude its usage for a special event .

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2132	Discussion: The THRESHOLD requirement does not mean the operational schedule for the instrument assigned to the DS task will simply consist of sequential nearly full disk "sounding" images. It does set a threshold ground sample rate for this instrument of 62 degrees local zenith angle in one hour including all on-board calibration and navigation, which will afford a coverage rate than can be used to make non-full disk observations. (Because the ground sample rate can also be understood in terms of nominally constant noise performance, it is helpful in understanding that moving to smaller pixels that the threshold DS value lead to smaller coverage areas as a consequence of the longer associated integration time.) The CONtinental United States (CONUS) area (defined approximately as the geographic area encompassing 10N-60N latitude and 60W-125W longitude), or the equivalent of a nadir-viewed rectangle 5000x3000 kilometers in dimension may be scanned more frequently, allowing more clear observations as clouds move. Clear observations yield better retrievals but there is interest in retrievals in the air over clouds. Southern Hemisphere oceanic regions may be scanned less frequently, which would allow observations over large regions without conventional observations (i.e., the Pacific Ocean). If the SW/M task is met with a separate instrument than that performing the DS task, then the instrument providing the DS task will concentrate on the 62-degree disk to support global modeling.	*Discussion*: The THRESHOLD requirement does not mean the operational schedule for the instrument assigned to the DS task will simply consist of sequential nearly full disk "sounding" images. It does set a threshold ground sample rate for this instrument of 62 degrees local zenith angle in one hour including all on-board calibration and navigation, which will afford a coverage rate than can be used to make non-full disk observations. (Because the ground sample rate can also be understood in terms of nominally constant noise performance, it is helpful in understanding that moving to smaller pixels that the threshold DS value lead to smaller coverage areas as a consequence of the longer associated integration time.) The CONtinental United States (CONUS) area (defined approximately as the geographic area encompassing 10N-60N latitude and 60W-125W longitude), or the equivalent of a nadir-viewed rectangle 5000x3000 kilometers in dimension may be scanned more frequently, allowing more clear observations as clouds move. Clear observations yield better retrievals but there is interest in retrievals in the air over clouds. Southern Hemisphere oceanic regions may be scanned less frequently, which would allow observations over large regions without conventional observations (i.e., the Pacific Ocean). *If the SW/M task is met with a separate instrument than that performing the DS task, then the instrument providing the DS task will concentrate on the 62-degree disk to support global modeling.*
2142	This MRD ties instrument requirements to these retrieval accuracies. Radiances are described in subsequent sections of this document. For the HES, there is an interest in soundings in air above the clouds and consequently the retrievals from such a region may be impacted by additional uncertainties from cloud signal interaction. The NEdN values listed later in this document	This MRD ties instrument requirements to these retrieval accuracies. Radiances are described in subsequent sections of this document. The need for all weather soundings will be partially addressed by a microwave instrument that is P^{3}I for GOES-R and partially addressed for sounding from the HES. For the HES, there is an interest in soundings in air above the clouds and consequently

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	reflect noise performance in clear air conditions only. Goal NEdN values in the shortwave infrared have also been listed to address sounding in the presence of partial cloud cover.	the retrievals from such a region may be impacted by additional uncertainties from cloud signal interaction. The NEdN values listed later in this document reflect noise performance in clear air conditions only. Goal NEdN values in the shortwave infrared have also been listed to address sounding in the presence of partial cloud cover.
6804	The need for all weather soundings will be partially addressed by a microwave instrument that is P^3I for GOES-R and partially addressed for sounding from the HES.	
5671	Table 2d. HES CW Task Observational Requirements Parameters Summary (Partial List)	
5707	Within 10 minutes (TBR) for all adjacent pixels for 400 km x 400 km observing areas (THRESHOLD), TBD (GOAL)	Within 10 minutes (TBR) for all adjacent pixels (THRESHOLD), TBD (GOAL)
5720	<= 0.3 km (<= 9 mrad) at SSP (THRESHOLD) for 1 sigma; 0.25 km (7 mrad) at SSP (GOAL) for 1 sigma (3x for 3 sigma)	<= 0.3 km (<= 9 mrad) at SSP (THRESHOLD); 0.25 km (7 mrad) at SSP (GOAL)
2196	Discussion: NOAA-NESDIS studied the benefits of extending the present lifetime of the current GOES series, as well as issues associated with extending the lifetime as a way to contain and reduce program costs. Given that new instruments are required to meet NWS requirements as well as provide replacements and new designs, it was timely to look at the longer life. However, long life may be traded against the insertion of new capabilities and/or technologies. Major long lifetime issues would be: Avoiding single point failure designs, long life evaluation through accelerated lifetime testing of selected components such as mechanisms, thermal control of optics and electronics, analyses such as FMECA (Failure Mode, Effects and Criticality Analysis). **	*Discussion:*' NOAA-NESDIS studied the benefits of extending the present lifetime of the current GOES series, as well as issues associated with extending the lifetime as a way to contain and reduce program costs. Given that new instruments are required to meet NWS requirements as well as provide replacements and new designs, it was timely to look at the longer life. However, long life may be traded against the insertion of new capabilities and/or technologies. Major long lifetime issues would be: Avoiding single point failure designs, long life evaluation through accelerated lifetime testing of selected components such as mechanisms, thermal control of optics and electronics, analyses such as FMECA (Failure Mode, Effects and Criticality Analysis). **
2213	Discussion: Because it is a goal for the DS task, the 4-km goal Ground Sampled Distance (GSD) is preferred over the 10 km THRESHOLD GSD. Because it is a goal for the SW/M task, the 2-	*Discussion*: Because it is a goal for the DS task, the 4-km goal Ground Sampled Distance (GSD) is preferred over the 10 km THRESHOLD GSD. Because it is a goal for the SW/M task, the 2-

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	km goal Ground Sampled Distance (GSD) is preferred over the 4-km THRESHOLD GSD.	km goal Ground Sampled Distance (GSD) is preferred over the 4-km THRESHOLD GSD.
2215	*Benefits:* Increasing the spatial resolution greatly increases the likelihood of obtaining clear-air soundings, and improves the ability of HES to obtain soundings adjacent to cloudy regions. There is a need to perform sounding under all conditions including cloudy conditions. A microwave instrument is anticipated to fulfill this need but there may be retrievals performed above cloud tops using an IR sounder.	*Benefits:* Increasing the spatial resolution greatly increases the likelihood of obtaining clear-air soundings, and improves the ability of HES to obtain soundings adjacent to cloudy regions. There is a need to perform sounding under all conditions including cloudy conditions. A microwave instrument is anticipated to fulfill this need but there may be retrievals performed above cloud tops using an IR sounder.
2216	Further Discussion: The spatial resolution of 10 km for the DS task corresponds approximately to that of the GOES I-M sounders, and is the coarsest acceptable spatial resolution of the HES. Because a sounding retrieval process is corrupted by the presence of cloud cover over even a portion of an IFOV (due to the high contrast in brightness temperature between clear and cloudy air), or by optical and focal plane effects, it is necessary to further refine the requirement for spatial resolution by specifying the detector-optics ensquared energy. This quantity specifies ensquared energy performance at the system level, with the phrase detector-optics used to emphasize the difference from the more typical usage of ensquared energy to refer to the optical performance only.	*Further Discussion*: The spatial resolution of 10 km for the DS task corresponds approximately to that of the GOES I-M sounders, and is the coarsest acceptable spatial resolution of the HES. Because a sounding retrieval process is corrupted by the presence of cloud cover over even a portion of an IFOV (due to the high contrast in brightness temperature between clear and cloudy air), or by optical and focal plane effects, it is necessary to further refine the requirement for spatial resolution by specifying the detector-optics ensquared energy. This quantity specifies ensquared energy performance at the system level, with the phrase detector-optics used to emphasize the difference from the more typical usage of ensquared energy to refer to the optical performance only.
2420	Discussion: The retrieval of soundings through "holes" in cloud cover, and near the edge of cloud-covered regions, is corrupted by crosstalk between samples that causes cloud contamination to affect nominally cloud-free FOVs. During Phase-A concept design and technology studies, it was determined that meeting an 80% detector-optics ensquared energy for the DS task requirement would entail an aperture diameter of at least 25 cm, and that further improvement in detector-optics ensquared energy (>90% would be gained by additional measures such as reducing the	Discussion: The retrieval of soundings through "holes" in cloud cover, and near the edge of cloud-covered regions, is corrupted by crosstalk between samples that causes cloud contamination to affect nominally cloud-free FOVs. During Phase-A concept design and technology studies, it was determined that meeting an 80% detector-optics ensquared energy for the DS task requirement would entail an aperture diameter of at least 25 cm, and that further improvement in detector-optics ensquared energy (>90% would be gained by additional measures such as reducing the detector fill-

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	detector fill-factor to optically isolate the FOVs, and/or by spatially tapering ("apodizing") the pupil illumination to reduce optical crosstalk arising from diffraction effects. It is expected that instrument performing the DS task may be less susceptible cloud corruption than the GOES I-M sounder if measures such as these are implemented.	factor to optically isolate the FOVs, and/or by spatially tapering ("apodizing") the pupil illumination to reduce optical crosstalk arising from diffraction effects. It is expected that instrument performing the DS task may be less susceptible cloud corruption than the GOES I-M sounder if measures such as these are implemented.
2423	Horizontal cell size is a measure of the area (assumed square), which corresponds to either the reporting sample, for a retrieved sounding in the case of the DS or SW/M, or a reporting sample size in the case of the OO and CW tasks. For all task, the THRESHOLD horizontal cell size is equivalent to the THRESHOLD spatial sampling size (see 3.B.2.d. above), measured at the SSP. For all task, the GOAL horizontal cell size is equivalent to the GOAL spatial sampling size (see 3.B.2.d. above), measured at the SSP. *Discussion: In the GOES-R timeframe, the horizontal cell size corresponds to the IFOV. The cell size may contain multiple sub-threshold IFOVs when averaging of several cells are used to reduce NEdN.*	Horizontal cell size is a measure of the area (assumed square), which corresponds to either the reporting sample, for a retrieved sounding in the case of the DS or SW/M, or a reporting sample size in the case of the OO and CW tasks. For all task, the THRESHOLD horizontal cell size is equivalent to the THRESHOLD spatial sampling size (see 3.B.2.d. above), measured at the SSP. For all task, the GOAL horizontal cell size is equivalent to the GOAL spatial sampling size (see 3.B.2.d. above), measured at the SSP. Discussion: In the GOES-R timeframe, the horizontal cell size corresponds to the IFOV. The cell size may contain multiple sub-threshold IFOVs when averaging of several cells are used to reduce NEdN.
2427	The abbreviated spectral coverage requirements listed below have been abstracted from the examples listed below in Tables 4a, 4aa, and 4b. The first eight values together provide profile coverage of temperature information from the CO_2 feature near 15 um, clear window regions, coverage of the ozone feature neat 9.6 um, and detection of volcanic ash and thin cirrus. The next two points demonstrate water vapor coverage. The last three points provide shortwave coverage, which is helpful in determining tropospheric temperature, surface skin temperature, fire effects and cloud cover including fog. When multiple values are listed in the columns below, for consistency the user should select either 1) the first	The abbreviated spectral coverage requirements listed below have been abstracted from the examples listed below in Tables 4a, 4aa, and 4b. The first eight values together provide profile coverage of temperature information from the CO_2 feature near 15 um, clear window regions, coverage of the ozone feature neat 9.6 um, and detection of volcanic ash and thin cirrus. The next two points demonstrate water vapor coverage. The last three points provide shortwave coverage, which is helpful in determining tropospheric temperature, surface skin temperature, fire effects and cloud cover including fog. When multiple values are listed in the columns below, for consistency the user should select either 1) the first

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	listing in each column for all columns, 2) the second listing for all columns or 3) the third listing for all columns. The complete listings of the example spectral coverage in Tables 4a, 4aa, and 4b and the corresponding NEdNs listed in Tables 6a, 6aa, and 6b may be helpful in any implementation because they are more detailed. The spectral resolution element listed in the table below is effectively the inverse of the maximum path difference. For the interferometric spectrometer, this is 1/(2L), where +L to -L is the maximum path difference. For the dispersive spectrometer, this is 1/(W(sin theta$_i$ + sin theta$_r$)) where W is the grating width, theta$_i$ is the angle of incidence, and theta$_r$ is the angle of reflection. The slight variation between the achieved resolution and the theoretical resolution is not critical here since the retrieval does not depend strongly on this level of variation. However, for reference the theoretical resolving power (out to the first zero, and 0.88 of half-maximum width) is R$_0$=lambda/(delta lambda) where lambda is the wavelength of interest and delta lambda is the spectral resolution element. The achieved resolving power is the quantity that is measured. The achieved resolving power is not only the convolution of the spectral feature with the dispersive/interferometric element function but also includes the convolution of the slit width. Thus the achieved resolving power (in terms of the half-maximum width) is R= R$_0$/u where u is the reduced slit width defined as the ratio of the exit slit width to the diffraction slit t width. Typical u is approximately 1.4, although it depends on the details of the system. More background information is included in the discussion for this section following the multiple tables below. *Discussion: Note that alternate definitions of the resolution element for the types of instrument alter the size of the resolution*	listing in each column for all columns, 2) the second listing for all columns or 3) the third listing for all columns. The complete listings of the example spectral coverage in Tables 4a, 4aa, and 4b and the corresponding NEdNs listed in Tables 6a, 6aa, and 6b may be helpful in any implementation because they are more detailed. The spectral resolution element listed in the table below is effectively the inverse of the maximum path difference. For the interferometric spectrometer, this is 1/(2L), where +L to -L is the maximum path difference. For the dispersive spectrometer, this is 1/(W(sin theta$_i$ + sin theta$_r$)) where W is the grating width, theta$_i$ is the angle of incidence, and theta$_r$ is the angle of reflection. The slight variation between the achieved resolution and the theoretical resolution is not critical here since the retrieval does not depend strongly on this level of variation. However, for reference the theoretical resolving power (out to the first zero, and 0.88 of half-maximum width) is R$_0$=lambda/(delta lambda) where lambda is the wavelength of interest and delta lambda is the spectral resolution element. The achieved resolving power is the quantity that is measured. The achieved resolving power is not only the convolution of the spectral feature with the dispersive/interferometric element function but also includes the convolution of the slit width. Thus the achieved resolving power (in terms of the half-maximum width) is R= R$_0$/u where u is the reduced slit width defined as the ratio of the exit slit width to the diffraction slit t width. Typical u is approximately 1.4, although it depends on the details of the system. More background information is included in the discussion for this section following the multiple tables below. Discussion: Note that alternate definitions of the resolution element for the types of instrument alter the size of the resolution element

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	element from the values listed below. This occurs in the HES PORD.	from the values listed below. This occurs in the HES PORD.
2428	Abstracted DS and SW/M task spectral coverage and resolution elements.	
2434	650 (GOAL) or 665 (THRESHOLD)	650
2591	Table 4a. Interferometric Sounder Waveband Descriptions Example 1 for DS and/or SW/M tasks (similar to GIFTS bands; see following discussion). A visible band is also required.	
2599	650 (G), 665 (T) - 1200	650 - 1200
2600	15.38 (G), 15.04 (T) - 8.33	15.38 - 8.33
2602	880 (G), 856 (T)	880
2608	Table 4aa. Interferometric Sounder Waveband Descriptions Example 2 for DS and/or SW/M tasks (similar to CrIS bands; see following discussion). A visible band is also required.	
2616	650 (G), 665 (T)- 1200	650 - 1200
2617	15.38 (G), 15.04 (T) - 8.33	15.38 - 8.33
2619	880 (G), 856 (T)	880
2630	Table 4b. Dispersive Sounder Waveband Descriptions Example for DS and/or SW/M tasks (grating type, but not AIRS specifically; see following discussion). A visible band is also required.	
2639	15.38 (G), 150.4 (T) -10.54	15.38 -10.54
2640	650 (G), 665 (G) - 950	650 - 950
2643	~<600	~600
2814	Discussion: The wavebands in Tables 4a and 4b have been selected for the DS task and the SW/M task based on their utility in producing the desired sounding retrievals, but see comments in this section above. (Of course, for a fuller range of applications, the entire infrared spectra would be ideal.)	*Discussion:* The wavebands in Tables 4a and 4b have been selected for the DS task and the SW/M task based on their utility in producing the desired sounding retrievals, but see comments in this section above. (Of course, for a fuller range of applications, the entire infrared spectra would be ideal.)

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2853	Table 5a. Blackbody temperatures for equivalent in-band scene radiances for interferometer performing the DS task and/or the SW/M task	
2862	Band 1: 650 (G), 665 (T)- 1200 cm^{-1}	Band 1: 650 - 1200 cm^{-1}
2863	290 for 650 coverage	290
2864	267 for 650 coverage	267
2865	234 for 650 coverage	234
2881	Goal levels are the first and third set of numbers in each of the four columns below and lower noise numbers in any location, particularly the IR. These reflect a lower level of noise performance in the SWIR that should afford better retrieval performance in the presence of clouds. This lower level of noise in the SWIR as a goal is 1/3 of the listed NEdN values.	
2889	650 (G)	650
2955	Table 6a. Example 1 maximum allowed NEdN for the DS task interferometric example at the Hot Test Target Temperature listed in Table 5a. (For reference, this set of NEdT's evaluated at 250 K has been included. For reference, the bin size has been listed here from the relevant portion of table 4).	
2963	650.00000 (G)	650.00000
3082	Table 6aa. Example 2 maximum allowed NEdN for the DS task interferometric example at the Hot Test Target Temperature listed in Table 5a. For reference, the bin size has been listed from table 4.	
3090	650 (G)	650
3274	Table 6b. Maximum allowed NEdN for the DS task dispersive example at listed Test Target Temperatures. For reference, the bin	

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	size has been listed from Table 4.	
3284	15.38 (G), 15.04 (T)-10.54	15.38-10.54
3285	650 (G), 665 (T) – 950	650 - 950
3311	Table 6c. Maximum allowed NEdN for the SW/M task interferometric example at the Hot Test Target Temperature listed in Table 5a. For reference, the bin size has been listed from Table 4.	
3319	650 (G)	650
3503	Table 6d. Maximum allowed NEdN for the SW/M task dispersive example at listed Test Target Temperatures. For reference, the bin size has been listed from Table 4.	
3513	15.38 (G), 15.04 (T) -10.54	15.38-10.54
3514	650 (G), 665 (T)- 950	650 - 950
3732	Groupings of contiguous inoperable pixels (as defined in section (2.10.2) 3.B.2.o.3) due to a short band break shall be no longer than 35 (TBS) resolution elements. The location choices of any spectral outages for short band breaks is guided by the critical spectral regions of interest identified in section (2.10.2) 3.B.2.g and retrieval analysis showing importance of spectral various spectral sub-regions. Spectral band breaks described in the spectral band break table below shall bet met.	
6228	650 (G) –665	650-665
6070	The HES-DS shall have no more than 8% (TBR) neighboring inoperable pixels in a 62 LZA frame including diagonal neighbors on a rectangular grid. The HES-SW/M shall have no more than 8% (TBR) neighboring inoperable pixels in a mesoscale frame including diagonal neighbors on a rectangular grid.	The HES-DS shall have no more than 0.05% (TBR) neighboring inoperable pixels in a 62 LZA frame including diagonal neighbors on a rectangular grid. The HES-SW/M shall have no more than 0.05% (TBR) neighboring inoperable pixels in a mesoscale frame including diagonal neighbors on a rectangular grid.

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6196	1 (TBR)	NONE
3793	Navigation Error Table	
3808	CW	CW
3809	Max of 1 GSA or 9 urad (TBR) (1 sigma); Max of 3 GSA or 27 urad (TBR) (3 sigma)	9 urad (TBR)
3810	Max of 0.5 GSA 7 (TBR) urad (1 sigma); Max of 3 GSA or 21 urad (TBR) (3 sigma)	7 (TBR) urad
3817	Discussion: The data format must allow integration of HES data with other NOAA's NWS data sources. To facilitate data use and integration, level 1b data will be distributed. While a 'fixed grid' projection makes sense for the ABI system, due to the non-linear nature and use of the sounder data, the native format is preferred.	*Discussion:* The data format must allow integration of HES data with other NOAA's NWS data sources. To facilitate data use and integration, level 1b data will be distributed. While a 'fixed grid' projection makes sense for the ABI system, due to the non-linear nature and use of the sounder data, the native format is preferred.
3820	Channel to channel registration, or co-registration errors, between IR bands involved in the same task for the DS task and the SW/M task shall not exceed ¼ of the IR GSA (0.25*IR IFOV at the SSP) (THRESHOLD) and 10% of the IR GSA (0.10*IR IFOV at SSP) (GOAL) and shall be acquired nearly simultaneously (see section 3.B.10). If the GSD is not the same for the bands particularly as in the case of the visible band (see 3.B.2.d), then multiple samples from the higher resolution shall be combined to match the GSD of the coarser resolution sample. The shift and the rotation shall be determined for all pixels, after known optical distortions are characterized and taken into account, including any affects of spacecraft motion. *Discussion: If all channels are observed simultaneously, then the co-registration error collapse to errors of overlapping images. In this case, it in anticipated that the co-registration error would be determined from array image overlap and as such knowledge of the actual co-registration errors at the corners of each array is required so that the shift and the rotation can be determined for all*	Channel to channel registration, or co-registration errors, between IR bands involved in the same task for the DS task and the SW/M task shall not exceed ¼ of the IR GSA (0.25*IR IFOV at the SSP) (THRESHOLD) and 10% of the IR GSA (0.10*IR IFOV at SSP) (GOAL) and shall be acquired nearly simultaneously (see section 3.B.10). If the GSD is not the same for the bands particularly as in the case of the visible band (see 3.B.2.d), then multiple samples from the higher resolution shall be combined to match the GSD of the coarser resolution sample. The shift and the rotation shall be determined for all pixels, after known optical distortions are characterized and taken into account, including any affects of spacecraft motion. *Discussion:* If all channels are observed simultaneously, then the co-registration error collapse to errors of overlapping images. In this case, it in anticipated that the co-registration error would be determined from array image overlap and as such knowledge of the actual co-registration errors at the corners of each array is required so that the shift and the rotation can be determined for all pixels. If

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	pixels. If all of the channels are not observed simultaneously, then spacecraft effects will impact the co-registration, increasing the difference in the navigation errors between channels over the scenario of simultaneous observations.	all of the channels are not observed simultaneously, then spacecraft effects will impact the co-registration, increasing the difference in the navigation errors between channels over the scenario of simultaneous observations.
3826	The co-registration error of the reflected solar bands < 1 um of the CW task shall be less than or equal to 19 microradians (TBR) (THRESHOLD) and less than or equal to 6.5 microradians (TBR) (GOAL). The 3 sigma values are three times larger than the original 1 sigma number for a radial value, or 3 times root 2 maximum for an E-W component and a N-S component as specified here. The co-registration error of the reflected solar bands < 1 um of the CW task to both the reflected solar > 1 um bands of the CW task and the reflected solar < 1 um bands of the CW task shall be less than or equal to 19 microradians (TBR) (THRESHOLD) and less than or equal to 6.5 urad (TBR) (GOAL). The co-registration error of the GOAL LWIR bands of the CW task to the reflected solar bands < 1 um of the CW task and the reflected solar > 1 um shall be less than or equal 30 microradians (TBR) (THRESHOLD) and less than or equal to 10.5 urad (GOAL).	The co-registration error of the reflected solar bands < 1 um of the CW task shall be less than or equal to 9 microradians (0.3 km at the SSP) (TBR) (THRESHOLD) and less than or equal to 3 microradians (0.25 km at the SSP) (TBR) (GOAL). The co-registration error of the reflected solar bands < 1 um of the CW task to the both the reflected solar > 1 um bands of the CW task and the reflected solar < 1 um bands of the CW task shall be less than or equal to 9 microradians (0.3 km at the SSP) (TBR) (THRESHOLD) and less than or equal to 3 urad (TBR) (0.25 km at the SSP) (GOAL). The co-registration error of the GOAL LWIR bands of the CW task to the reflected solar bands < 1 um of the CW task and the reflected solar > 1 um shall be less than or equal 14 microradians (0.5 km at the SSP) (TBR) (THRESHOLD) and less than or equal to 7 urad (0.25 km at the SSP) (GOAL).
3852	2.12 (TBR) GSA or 19 urad (TBR)	1.0 (TBR) GSA or 9 urad (TBR)
3880	2.12 (TBR) GSA or 19 urad (TBR)	1.0 (TBR) GSA or 9 urad (TBR)
3890	Discussion: These requirements are intended to define the limits of acceptable within- image distortions. There will be DS task and/or SW/M task products based on and displayed for each pixel location. There will also be OO and CW products for each pixel.	*Discussion:* These requirements are intended to define the limits of acceptable within- image distortions. There will be DS task and/or SW/M task products based on and displayed for each pixel location. There will also be OO and CW products for each pixel.
3911	2.12 (TBR) GSA or 19 urad (TBR), over 60 minutes	1.0 (TBR) GSA or 9 urad (TBR), over 60 minutes
3925	Data from all bands for the HES-SW/M task obtained for any specific point on Earth must be coincident within 10 (TBR) seconds (THRESHOLD) and within 5 seconds (GOAL).	Data form all bands for the HES-SW/M task obtained for any specific point on Earth must be coincident within 10 (TBR) seconds (THRESHOLD) and within 5 seconds (GOAL).

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3927	Data from all bands for the HES-CW task obtained for any specific point on Earth must be coincident within 15 (TBR) seconds (THRESHOLD) and within 10 seconds (GOAL). These values are not to exceed values.	Data from all bands for the HES-CW task obtained for any specific point on Earth must be coincident within (TBR) seconds (THRESHOLD) and within 10 seconds (GOAL). These values are not to exceed values.
3928	Discussion: The simultaneity requirements for the DS, SW/M, OO, and CW tasks are needed to ensure accurate generation of any multiband products that depend on data from all spectral bands. In particular, this requirement is imposed to attempt to ensure that cloud cover is consistent during the observations.	*Discussion*: The simultaneity requirements for the DS, SW/M, OO and CW tasks are needed to ensure accurate generation of any multiband products that depend on data from all spectral bands. In particular, this requirement is imposed to attempt to ensure that cloud cover is consistent during the observations.
3936	Discussion: The pixel-to-pixel simultaneity requirements for the DS, SW/M, OO, and CW tasks are needed to minimize time gaps across swaths. This limits shear between swaths. The pixel-to-pixel simultaneity does not apply outside of its task.	*Discussion*: The pixel-to-pixel simultaneity requirements for the DS, SW/M, OO and CW tasks are needed to minimize time gaps across swaths. This limits shear between swaths. The pixel-to-pixel simultaneity does not apply outside of its task.
3939	Discussion: Routine operations should not be re-established too quickly to endanger the health or safety of the instrument. The design should minimize degradation to navigation ability from sun exposure on the scan mirror and the rest of the imager.	*Discussion:* Routine operations should not be re-established too quickly to endanger the health or safety of the instrument. The design should minimize degradation to navigation ability from sun exposure on the scan mirror and the rest of the imager.
3948	Benefits: All soundings and products rely on accurate calibration. Discussion: Quantitative products derived from imager data for weather forecasting demand stable, calibrated data. Accurate knowledge of the system spectral response function (SRF), including both in-band and out-of-band response, is required for each band and the on-board black body is required. Relative precision includes line-to-line, detector-to-detector, and frame-to-frame repeatability of the measurement of the brightness temperature of a uniform scene.	*Benefits:* All soundings and products rely on accurate calibration. *Discussion: Quantitative products derived from imager data for weather forecasting demand stable, calibrated data. Accurate knowledge of the system spectral response function (SRF), including both in-band and out-of-band response, is required for each band and the on-board black body is required. Relative precision includes line-to-line, detector-to-detector, and frame-to-frame repeatability of the measurement of the brightness temperature of a uniform scene.*
3950	Because the IR bands of these tasks do not lie in the thermal IR range (except two bands in the CW task), the IR bands fall into the reflective solar range.	Because the IR bands of these tasks do not lie in the thermal IR range (except two bands in the CW task), the IR bands fall into the reflective solar range. The reflective solar of the OO or CW tasks

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		shall be calibrated prior to launch to provide albedo to an accuracy of 3 (TBR) % at maximum scene radiance, listed as "maximum" in the appendix. This reflective solar calibration performed pre-launch should be stable and compared to a NIST reference. Signal from these reflective solar bands shall be quantized in such a way that the signal will not saturate (high counts or low counts) over the life of the instrument and under worst-case conditions. An onboard full optical train, full aperture calibrator shall be used to perform calibrations during the life of the instrument performing these tasks (see discussion). The require calibration must provide absolute accuracy of 3% or less at 100% albedo, RMS (short-term)repeatability of the band difference of +/-0.2% or less, and drift in absolute calibrated radiances of 0.5% over the instrument lifetime. *Relative calibrations accuracy shall be 1% or better. * For the LWIR bands of the CW task, the IR calibration described in 3.B.13. above applies.
3966	d) Image Navigation and Registration shall be permitted to degrade over a 4 hour period near the eclipse. The phase of the period may be design dependent. All eclipse thresholds are written in the form of angles. The Ground Sample Angle is the angle subtended by a single pixel at nadir so that a 10 km IR spatial resolution THRESHOLD of the DS task by definition subtends a 280 urad GSA. The eclipse THRESHOLD level of the navigation requirement for the DS task is 0.75 of the IR detector element IFOV. The eclipse THRESHOLD level of the navigation requirement for the SW task is 0.75 of the IR detector element IFOV. The eclipse THRESHOLD level of the navigation requirement for the CW task is 40.5 urad. The eclipse	d) Image Navigation and Registration shall be permitted to degrade over a 4 hour period near the eclipse. The phase of the period may be design dependent. All eclipse thresholds are written in the form of angles. The Ground Sample Angle is the angle subtended by a single pixel at nadir so that a 10 km IR spatial resolution THRESHOLD of the DS task by definition subtends a 280 urad GSA. The eclipse THRESHOLD level of the navigation requirement for the DS task is 0.75 of the IR detector element IFOV. The eclipse THRESHOLD level of the navigation requirement for the SW task is 0.75 of the IR detector element IFOV. The eclipse THRESHOLD level of the navigation requirement for the CW task is 13.5 urad. The eclipse

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	THRESHOLD level of the navigation requirement for the OO task is 42 urad. The eclipse THRESHOLD level of the navigation requirement for the ABI backup mode is 0.75*(Vendor IR IFOV). For all tasks, the eclipse GOAL navigation is the same as the goal navigation described in section (2.10.2) 3.B.3.	THRESHOLD level of the navigation requirement for the OO task is 42 urad. The eclipse THRESHOLD level of the navigation requirement for the ABI backup mode is 0.75*(Vendor IR IFOV). For all tasks, the eclipse GOAL navigation is the same as the goal navigation described in section (2.10.2) 3.B.3.
6870	The reflective solar of the OO or CW tasks shall be calibrated prior to launch to provide albedo to an accuracy of 3 (TBR) % at maximum scene radiance, listed as "maximum" in the appendix. This reflective solar calibration performed pre-launch should be stable and compared to a NIST reference.	
6869	Signal from these reflective solar bands shall be quantized in such a way that the signal will not saturate (high counts or low counts) over the life of the instrument and under worst-case conditions. An onboard full optical train, full aperture calibrator shall be used to perform calibrations during the life of the instrument performing these tasks (see discussion).	
6868	The visible band calibration shall provide absolute accuracy of 3% or less at 100% albedo, RMS (short-term)repeatability of the band difference of +/-0.2% or less, and drift in absolute calibrated radiances of 0.5% over the instrument lifetime. *Relative calibrations accuracy shall be 1% or better. *	
6867	For the LWIR bands of the CW task, the IR calibration described in 3.B.13. above applies.	
6060	Discussion: NOAA wants an onboard, reflected solar < 3 um calibration capability, but it must not introduce significant costs or risks through its approach or technology to the HES's lifetime. A failure of the onboard calibration device shall not cause failure of the entire HES mission. Complementary multiple techniques can be used to implement calibration. A NOAA workshop held on May 19, 1999 explored the availability of onboard ABI visible and near IR technologies and approaches. The results of the workshop	*Discussion:* NOAA wants an onboard, reflected solar < 3 um calibration capability, but it must not introduce significant costs or risks through its approach or technology to the HES's lifetime. A failure of the onboard calibration device shall not cause failure of the entire HES mission. Complementary multiple techniques can be used to implement calibration. A NOAA workshop held on May 19, 1999 explored the availability of onboard ABI visible and near IR technologies and approaches. The results of the workshop are

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	are contained in JPL report "In Flight Visible and Near Infrared Calibration of Future GOES Imagers Workshop report," Dave Norris, October 1999, JPL report D-17846. The above onboard calibration requirements identified at the workshop were discussed as limits of what could be achieved. Ultimately, the lowest GPRD product accuracy of 5% is the driver. Thus the radiometric calibration will be tighter, at 3%. What NOAA wants is an onboard capability and some progress towards these limits.	contained in JPL report "In Flight Visible and Near Infrared Calibration of Future GOES Imagers Workshop report," Dave Norris, October 1999, JPL report D-17846. The above onboard calibration requirements identified at the workshop were discussed as limits of what could be achieved. Ultimately, the lowest GPRD product accuracy of 5% is the driver. Thus the radiometric calibration will be tighter, at 3%. What NOAA wants is an onboard capability and some progress towards these limits.
6049	Discussion: Instrument intercomparison across platforms in all wavebands will be performed by NOAA, but nothing additional is mandated to the instrument vendor because of this plan.	*Discussion:* Instrument intercomparison across platforms in all wavebands will be performed by NOAA, but nothing additional is mandated to the instrument vendor because of this plan.
3963	a) For the DS task and or the SW/M task, all operable detector elements in the emitted IR bands (650 (G), 665 (T) to 2250 cm^{-1}) shall have NEdN values no more than two (2) times their respective NEdN values under normal operating conditions. See section 3.B.2. Operable detectors are defined in section 3.B.2.o. NEdN values under normal operating conditions are listed in section 3.B.2.m (Table 5a and Table 5b). Requirements placed on the FPA pixels to meet these NEdN values are described in section 3.B.2.o. Recovery time is described in section (2.10.2) 3.B.	a) For the DS task and or the SW/M task, all operable detector elements in the emitted IR bands (650 to 2250 cm^{-1}) shall have NEdN values no more than two (2) times their respective NEdN values under normal operating conditions. See section 3.B.2. Operable detectors are defined in section 3.B.2.o. NEdN values under normal operating conditions are listed in section 3.B.2.m (Table 5a and Table 5b). Requirements placed on the FPA pixels to meet these NEdN values are described in section 3.B.2.o. Recovery time is described in section (2.10.2) 3.B.
3967	Discussion: Section 3.A.1 contains further discussion. Thorough analysis and innovative designs are encouraged to minimize this "keep-out-zone" phenomenon.	*Discussion*: Section 3.A.1 contains further discussion. Thorough analysis and innovative designs are encouraged to minimize this "keep-out-zone" phenomenon.
3971	Discussion: A serious handicap to producing accurate infrared only sounding retrievals is the difficulty of dealing with cloud contamination. Experience has shown that visible data are of great benefit during daylight hours for identifying cloud-free FOVs, especially the higher resolution visible data (sub-IR pixel size). Perhaps more importantly, however, high-resolution visible data may allow for correcting IR radiances for subpixel cloud contamination, permitting retrievals of clear air sounding and	*Discussion:* A serious handicap to producing accurate infrared only sounding retrievals is the difficulty of dealing with cloud contamination. Experience has shown that visible data are of great benefit during daylight hours for identifying cloud-free FOVs, especially the higher resolution visible data (sub-IR pixel size). Perhaps more importantly, however, high-resolution visible data may allow for correcting IR radiances for subpixel cloud contamination, permitting retrievals of clear air sounding and cloud

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	cloud information in more of the meteorologically active areas. High-resolution sounders such as the HES can anticipate frequent cloud contamination near storm systems so that sounding will improve with contemporaneous and collocated high-resolution visible data.	information in more of the meteorologically active areas. High-resolution sounders such as the HES can anticipate frequent cloud contamination near storm systems so that sounding will improve with contemporaneous and collocated high-resolution visible data.
3975	Discussion: Due to the increased dwell times compared to an imager, the sounder visible data may be more sensitive in low-light regions.	*Discussion:* Due to the increased dwell times compared to an imager, the sounder visible data may be more sensitive in low-light regions.
3983	For sounding, knowledge of the spectral line center shall be 1 part in 10^5 (TBR) or better (smaller) over all time at all wavenumbers and wavelengths.	Knowledge of the spectral line center shall be 1 part in 10^5 (TBR) or better (smaller) over all time at all wavenumbers and wavelengths.
3984	For sounding, line center stability (GOAL) shall be 3 parts in 10^5 (TBR) over all time.	Line center stability (GOAL) shall be 3 parts in 10^5 (TBR) over all time.
3985	Discussion: This level of performance is estimated to be required for good retrieval performance. The technical difficulty in maintaining this value must be assessed.	Discussion: This level of performance is estimated to be required for good retrieval performance. The technical difficulty in maintaining this value must be assessed.
3991	Each GPRD-1 product requirement for the space weather instruments leads to a separate instrument. Thus the GPRD requirements are the same as the MRD requirements summarized in the tables through this section. All requirements, including those in the text of this section, will be met/addressed by the magnetometer (considered part of the spacecraft), the SIS, and the SEISS described immediately below.	Each GPRD-1 product requirement for the space weather instruments leads to a separate instrument. Thus the GPRD requirements are the same as the MRD requirements summarized in the tables through this section. All requirements, including those in the text of this section, will be met/addressed by the magnetometer (considered part of the spacecraft), the SIS, and the SEISS described immediately below. For reference only, additional P^3I products are currently listed in Appendix A.
6805	For reference only, additional P^3I products are currently listed in Appendix A.	
3998	Discussion: In particular, the magnetometer, particle sensors, and solar X-Ray sensor of the Space Environment Monitor (SEM) suite in the previous series have a long history of archived data that have proved to be especially useful for many areas of research and space climatology. These space environment measurements	Discussion: In particular, the magnetometer, particle sensors, and solar X-Ray sensor of the Space Environment Monitor (SEM) suite in the previous series have a long history of archived data that have proved to be especially useful for many areas of research and space climatology. These space environment measurements made by

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	made by GOES have become standards for the space weather users. Beginning with GOES 12, the Solar X-ray Imager (SXI), and beginning with GOES N, the EUV sensors represent new observations that will be used as new standards for space weather forecasters and users.	GOES have become standards for the space weather users. Beginning with GOES 12, the Solar X-ray Imager (SXI), and beginning with GOES N, the EUV sensors represent new observations that will be used as new standards for space weather forecasters and users.
4003	Discussion: A magnetometer provides a map of the space environment that controls charged particle dynamics in the outer region of the magnetosphere. Magnetic field measurements provide information on the general level of geomagnetic activity, monitor current systems in space, and permit detection of magnetopause crossings, storm sudden commencements, and substorms.	*Discussion*: A magnetometer provides a map of the space environment that controls charged particle dynamics in the outer region of the magnetosphere. Magnetic field measurements provide information on the general level of geomagnetic activity, monitor current systems in space, and permit detection of magnetopause crossings, storm sudden commencements, and substorms.
4016	Discussion: This shall be accomplished by adding known fields to the ambient field by ground command.	*Discussion:* This shall be accomplished by adding known fields to the ambient field by ground command.
4022	Discussion: The design should eliminate spacecraft static and dynamic fields at the instrument location in order to facilitate ground-based data processing. Particular care should be taken to eliminate permeable and permanent magnetic material close to the instrument. A ground test program is necessary to demonstrate that on-orbit specifications will be met: examples included spacecraft stray and DC magnetic interference testing.	*Discussion*: The design should eliminate spacecraft static and dynamic fields at the instrument location in order to facilitate ground-based data processing. Particular care should be taken to eliminate permeable and permanent magnetic material close to the instrument. A ground test program is necessary to demonstrate that on-orbit specifications will be met: examples included spacecraft stray and DC magnetic interference testing
4054	Discussion: These particle fluxes roughly consist of three components: 1) a geomagnetically trapped and highly variable population of electrons and protons 2) sporadic fluxes of electrons, protons, and heavy ions of direct solar origin and 3) the galactic cosmic background. Knowledge of the near-Earth energetic particle environment is important in establishing the natural radiation hazard to humans at high altitudes and in space, as well as risk assessment and warning of episodes of surface charging, deep dielectric charging, and single event upsets of satellite systems. Energetic particle precipitation into the Earth's	*Discussion:* These particle fluxes roughly consist of three components: 1) a geomagnetically trapped and highly variable population of electrons and protons 2) sporadic fluxes of electrons, protons, and heavy ions of direct solar origin and 3) the galactic cosmic background. Knowledge of the near-Earth energetic particle environment is important in establishing the natural radiation hazard to humans at high altitudes and in space, as well as risk assessment and warning of episodes of surface charging, deep dielectric charging, and single event upsets of satellite systems. Energetic particle precipitation into the Earth's ionosphere also

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	ionosphere also causes disturbance and disruption of radio communications and navigation systems. These impacts may be mitigated by early warnings of high flux episodes.	causes disturbance and disruption of radio communications and navigation systems. These impacts may be mitigated by early warnings of high flux episodes.
4057	Discussion: The energy range of the > 2 MeV electron energy channels has been chosen to provide continuity with prior measurements.	*Discussion*: The energy range of the > 2 MeV electron energy channels has been chosen to provide continuity with prior measurements.
4065	Discussion: Previous experience has indicated that the calibration mode, which is both self-terminating and able to be terminated by ground command, is needed.	*Discussion*: Previous experience has indicated that the calibration mode, which is both self-terminating and able to be terminated by ground command, is needed.
4070	Discussion: Calibration can be performed by using a combination of accelerators and/or nuclear sources.	*Discussion:* Calibration can be performed by using a combination of accelerators and/or nuclear sources.
4145	Discussion: The primary function of the XRS is to provide a means of detecting the beginning, duration, and magnitude of solar X-ray flares.	Discussion: The primary function of the XRS is to provide a means of detecting the beginning, duration, and magnitude of solar X-ray flares.
4147	Discussion: X-ray flares affect HF communications at Earth and are a key indicator of potential geoeffective solar activity. Detected solar flares are classified according to their peak fluxes in the 0.1 - 0.8 nm channel: class C, M, and X corresponds to peak fluxes of 1, 10, and 100 x 10^{-6} W m^{-2}, respectively.	Discussion: X-ray flares affect HF communications at Earth and are a key indicator of potential geoeffective solar activity. Detected solar flares are classified according to their peak fluxes in the 0.1 - 0.8 nm channel: class C, M, and X corresponds to peak fluxes of 1, 10, and 100 x 10^{-6} W m^{-2}, respectively.
4197	Discussion: Solar variability at these wavelengths is one of the primary drivers of thermospheric/ionospheric variability, which in turn affects radio communication, navigation, and satellite drag. Uncertainties in the solar EUV flux are a major source of errors in specification and modeling of the thermosphere and ionosphere.	Discussion: Solar variability at these wavelengths is one of the primary drivers of thermospheric/ionospheric variability, which in turn affects radio communication, navigation, and satellite drag. Uncertainties in the solar EUV flux are a major source of errors in specification and modeling of the thermosphere and ionosphere.
4203	***2.10.4.4.1 GOES Solar EUV Sensor Observational Requirements***	
5998	From 5 to 35 nm	From 5 to 35 nm
6001	From 35 to 115 nm	From 35 to 115 nm
6004	From 118 to 127 nm	From 118 to 127 nm

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4244	Discussion: Available combinations of exposures and filters allows the autonomous coverage of the entire dynamic range of solar X-ray features, from coronal holes to X-class flares, as well as the estimate of temperature and emission measure. The operational goals are to: locate coronal holes for geomagnetic storm forecasts, detect and locate flares for forecasts of solar energetic particle (SEP) events related to flares, monitor changes in the corona that indicate coronal mass ejections (CMEs), detect active regions beyond east limb for F10.7 forecasts, and analyze active region complexity for flare forecasts.	Discussion: Available combinations of exposures and filters allows the autonomous coverage of the entire dynamic range of solar X-ray features, from coronal holes to X-class flares, as well as the estimate of temperature and emission measure. The operational goals are to: locate coronal holes for geomagnetic storm forecasts, detect and locate flares for forecasts of solar energetic particle (SEP) events related to flares, monitor changes in the corona that indicate coronal mass ejections (CMEs), detect active regions beyond east limb for F10.7 forecasts, and analyze active region complexity for flare forecasts.
4246	Discussion: Because improved capabilities are under discussion for this instrument compared to the original SXI, it has been called Extended SXI (ESXI).	Discussion: Because improved capabilities are under discussion for this instrument compared to the original SXI, it has been called Extended SXI (ESXI)
6013	Discussion: The spatial/angular resolution is has been written in terms of the encircled energy requirement.	Discussion: The spatial/angular resolution is has been written in terms of the encircled energy requirement.
4291	Discussion: Refresh rate for 'imaging' refers to full measurement range coverage in a single bandpass filter. This may consist of multiple images with different exposures. Refresh rate for temperature assumes that full measurement range data in at least three bandpass filters is required for temperature retrieval.	Discussion: Refresh rate for 'imaging' refers to full measurement range coverage in a single bandpass filter. This may consist of multiple images with different exposures. Refresh rate for temperature assumes that full measurement range data in at least three bandpass filters is required for temperature retrieval.
4293	Discussion: Examples include flagging spacecraft or other instrument operations that adversely affect SXI performance such as blackbody calibration and calibration of other instruments.	Discussion: Examples include flagging spacecraft or other instrument operations that adversely affect SXI performance such as blackbody calibration and calibration of other instruments.
4295	Discussion: SXI images should be taken at a regular cadence with a phase drift of no more than 1.0 second per day. The need to precisely phase SXI images should not preclude the ability to simply take images at a faster or slower pace. Images must be downlinked in the order taken.	Discussion: SXI images should be taken at a regular cadence with a phase drift of no more than 1.0 second per day. The need to precisely phase SXI images should not preclude the ability to simply take images at a faster or slower pace. Images must be downlinked in the order taken.
4299	Discussion: The primary function of the Solar COROnagraph	*Discussion*: The primary function of the Solar COROnagraph

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	(SCOR) is early detection of coronal mass ejections (CMEs). CMEs are one of two main drivers of geomagnetic storms and the main driver of the largest storms. The coronagraph will provide one to three day warnings of geomagnetic storms.	(SCOR) is early detection of coronal mass ejections (CMEs). CMEs are one of two main drivers of geomagnetic storms and the main driver of the largest storms. The coronagraph will provide one to three day warnings of geomagnetic storms.
4350	The GLM shall continuously detect lightning over the full disk view of the earth as seen from the satellite location. The full disk covers nominally 17.76 degrees, with the exception of limb darkening effects. The full disk coverage includes CONUS and the mesoscale which are contained in the full disk view.	The GLM shall continuously detect lightning over the full disk view of the earth as seen from the satellite location. The full disk covers nominally 17.76 degrees, with the exception of limb darkening effects. The full disk includes the CONUS and the mesoscale.
4351	Discussion: Lightning must be detected from all of the areas listed above all of the time, not by scanning the entire full disk area and sampling only a portion of it at one time and another portion at a later time.	*Discussion*: Lightning must be detected from all of the areas listed above all of the time, not by scanning the entire full disk area and sampling only a portion of it at one time and another portion at a later time.
4353	Discussion: Lightning will illuminate the entire cloud but there is a need to sample at a 4 km spatial resolution in order to better identify the location of the storm cells.*	Discussion: Lightning will illuminate the entire cloud but there is a need to sample at a 4 km spatial resolution in order to better identify the location of the storm cells.*
4355	Discussion: Distinguishing between the various types of lightning (cloud-to-ground versus cloud-to-cloud) is not required.	*Discussion:* Distinguishing between the various types of lightning (cloud-to-ground versus cloud-to-cloud) is not required.
4357	The frame to frame registration error shall be less than or equal to 0.5*spatial resolution (TBR) (THRESHOLD) over 1 second. The goal for this quantity shall be less than or equal to 0.25*spatial resolution (TBR) over 1 second.	The frame to frame registration error shall be less than or equal to 0.5*spatial resolution (TBR) (THRESHOLD). The goal for this quantity shall be less than or equal to 0.25*spatial resolution (TBR) over 1 second.
4359	The GLM data must be delivered in TBS seconds to the ground to allow for all processing to be completed to meet the 1 minute latency to the level 1b.	The data must be delivered in TBS seconds to the ground to allow for all processing to be completed to meet the 1 minute latency to the level 1b.
4360	The GLM shall detect lightning pulses, which can occur with a 1ms duration. *Discussion: Lightning flashes are composed of pulses.*	The GLM shall detect lightning flashes, which can occur with a 1ms duration.
4401	RF Bandwidth (See appendix B and relevant IRD)	RF Bandwidth (See appendix B)

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4402	X-Band downlink (see appendix B for numeric bandwidths and relevant IRD)	X-Band downlink (see appendix B for numeric bandwidths)
4428	***2.10.8.3.1 GOES-Rebroadcast***	2.10.8.3.1 GOES Rebroadcast
4429	The GOES-Re-Broadcast (GRB) transponder shall support the processed data distribution from the CDAS to various receive sites including NOAA's NWS, DoD, international users, and research organizations.	The GOES Re-Broadcast (GRB) transponder shall support the processed data distribution from the CDAS to various receive sites including NOAA's NWS, DoD, international users, and research organizations.
4430	The GOES-Re-Broadcast (GRB) transponder shall support the rebroadcast of the ground processed weather data from the CDAS to a wide community of NWS and governmental and academic research organizations. This link shall have the following basic characteristics:	The GOES Re-Broadcast (GRB) transponder shall support the rebroadcast of the ground processed weather data from the CDAS to a wide community of NWS and governmental and academic research organizations. This link shall have the following basic characteristics:
4432	Data Rate 17 Mbit/s total (Threshold) including all overhead (TBR) and 24 Mbps GOAL (TBR) including all overhead. *Discussion: More information in available in Appendix B on the increase in available bandwidth to afford additional communication capability for GOES-R and specifically the GRB capacity.*	Data Rate 5 Mbit/s total (Threshold) including all overhead (TBR) and 24 Mbps GOAL (TBR) including all overhead. Discussion: More information in available in Appendix B on the increase in available bandwidth to afford additional communication capability for GOES-R and specifically the GRB capacity.
4436	RF Bandwidth (See appendix B and relevant IRD) (TBR).	RF Bandwidth (See appendix B) (TBR).
4437	RF Band Uplink: S-Band (TBR, X-Band is being considered) (see appendix B for numeric band frequencies and relevant IRD).	RF Band Uplink: S-Band (TBR, X-Band is being considered) (see appendix B for numeric band frequencies).
4450	Required BER $1 \cdot 10^{-5}$ at 99.9% availability, worst month (TBR)	Required BER $5 \cdot 10^{-5}$ at 99.9% availability, worst month (TBR)
4453	Downlink: L-Band (see Appendix B and relevant IRD)	Downlink: L-Band (see Appendix B)
4458	Definition: The Data Collection Platforms (DCP) in the Data Collection System (DCS) is a data link that provides a service. The DCS channel plays a significant role in supporting critical national	Definition: The Data Collection Platforms (DCP) in the Data Collection System (DCS) is a data link that provides a service. The DCS channel plays a significant role in supporting critical national

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	systems important to the safety of citizens, commerce, shipping, and farming among other things. Data obtained from this service is also widely used by the National Weather Service. *Discussion: Support to the DCS is provided by two satellite transponders. These correspond to (1) the links required for the Data Collection Platforms (DCP's) to provide reported data to the CDAS and other Direct Readout Ground Stations (DRGS) termed Data Collection Platform Report (DCPR) links and (2) an outbound polling link from the CDAS to the DCP's termed the Data Collection Platform Interrogate (DCPI) link. The Data Collection Platform Report (DCPR) transponder supports the link from a large number of small data platforms in the DCS to the CDAS and other Direct Readout Ground Stations (DRGS). The Data Collection Platform Interrogate (DCPI) transponder supports a command link from the CDAS to selected platforms. In the GOES-R timeframe, the anticipated 89,000 (TBS) total platforms (Threshold) will be supported, with a goal of 158,000 supported platforms.*	systems important to the safety of citizens, commerce, shipping, and farming among other things. Data obtained from this service is also widely used by the National Weather Service. Discussion: Support to the DCS is provided by two satellite transponders. These correspond to (1) the links required for the Data Collection Platforms (DCP's) to provide reported data to the CDAS and other Direct Readout Ground Stations (DRGS) termed Data Collection Platform Report (DCPR) links and (2) an outbound polling link from the CDAS to the DCP's termed the Data Collection Platform Interrogate (DCPI) link. The Data Collection Platform Report (DCPR) transponder supports the link from a large number of small data platforms in the DCS to the CDAS and other Direct Readout Ground Stations (DRGS). The Data Collection Platform Interrogate (DCPI) transponder supports a command link from the CDAS to selected platforms. In the GOES-R timeframe, the anticipated 89,000 (TBS) total platforms (Threshold) will be supported, with a goal of 158,000 supported platforms.
4460	Discussion: DCS users project a large growth in usage, due to both more platforms and shorter report intervals. Additionally, the NWS estimates the value of DCS to be several billion dollars per year. These factors are likely to drive system loading near the capacity limits of the current DCPR system by the expected GOES-R launch date.	Discussion: DCS users project a large growth in usage, due to both more platforms and shorter report intervals. Additionally, the NWS estimates the value of DCS to be several billion dollars per year. These factors are likely to drive system loading near the capacity limits of the current DCPR system by the expected GOES R launch date.
4464	Data Rate Transmission rates of 100, 300, or 1200 bit/s, (transponder does not remodulate). *Discussion: Platforms with 100 bits/sec are anticipated to be decommissioned by 2012, which would leave only 300 or 1200 bits/sec platforms.*	Data Rate Transmission rates of 100, 300, or 1200 bit/s, (transponder does not remodulate), although a small number of platforms require data rates as high as 128 kbps (TBR). Discussion: Platforms with 100 bits/sec are

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	Any 128 kbps platforms may not be supportable on this system without a significant disruption to the existing system.	anticipated to be decommissioned by 2012, which would leave only 300 or 1200 bite/sec platforms. Any 128 kbps platforms may not be supportable on this system without a significant disruption to the existing system.
4470	Downlink: L-Band (see Appendix B and relevant IRD)	Downlink: L-Band (see Appendix B)
4479	Error Control Forward Error Correction (described in corresponding IRD)	Error Control Forward Error Correction (TBS)
4480	Required FER $1 \cdot 10^{-5}$ at 99.9% availability, worst month (TBR)	Required BER $1 \cdot 10^{-6}$ at 99.9% availability, worst month (TBR)
4493	Error Control Forward Error Correction (described in corresponding IRD)	Error Control TBS
4497	Downlink: L-Band (see Appendix B and relevant IRD)	Downlink: L-Band (see Appendix B)
4505	Data Rate Information rate 56 kbit/s, Transmission rate is 128 kbit/s (TBR) (transponder does not remodulate)	Data Rate Information rate 56 kbit/s, Transmission rate is approximately 77 kbit/s (TBR) (transponder does not remodulate)
4507	Error Control Forward Error Correction (as per corresponding IRD)	Error Control TBS
4508	Required FER $1 \cdot 10^{-5}$ at 99.9% availability, worst month (TBR) (Note Frame Error Rate) *Discussion: The largest frame rate is associated with the ABI full disk frames having the finest spatial resolution, namely the 0.5 km visible channel.)*	Required FER $1 \cdot 10^{-5}$ at 99.9% availability, worst month (TBR) (Note Frame Error Rate) Discussion: The largest frame rate is associated with the ABI full disk frames having the finest spatial resolution, namely the 0.5 km visible channel.)
4511	Downlink: L-Band (see Appendix B and relevant IRD)	Downlink: L-Band (see Appendix B)
6572	Coverage Uplink: Primary and backup CDAS from 75º W, 105º W (check-out), 105º W (storage and operations (TBS)) and 135 (TBS)º W satellite	Coverage Uplink: Primary and backup CDAS from 75º W, 105º W (check-out), 105º W (storage and operations (TBS)) and 135 (TBS)º W satellite locations.

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	locations. For all GOES-R series satellites, the primary CDA is located at Wallops Island, VA (TBR) with a backup at TBD with earth coverage to TBD elevation angle.	For all GOES-R series satellites, the primary CDA is located at Wallops Island, VA (TBR) with a backup at TBD.
4517	The spacecraft system shall perform any maneuvers, including any government-requested yaw flip, and recover to spacecraft performance and interface specifications in 30 (TBR) minutes (THRESHOLD) with a (GOAL) of 15 minutes.	The spacecraft system shall be capable of performing any maneuvers, including yaw flip, in 1.5 (TBR) hours.
4518	Discussion: Routine operations should not be re-established too quickly to endanger the health or safety of the instrument.	*Discussion:* Routine operations should not be re-established too quickly to endanger the health or safety of the instrument.
4527	As noted in section 1.4.6, both ABI and HES will contribute together to produce products. Typically the HES will operate more slowly than the ABI and thus it will provide background information that will be updated whenever new HES data is available. The products will use the most recent ABI data as well. Thus, the joint product requirements typically carry the parameters of the ABI (spatial resolution, updates, etc.), and consider HES data as the background field rather than imposing the product requirements on the HES as well as on the ABI.	As noted in section 1.4.6, both ABI and HES will contribute together to produce products. Typically the HES operates more slowly that the ABI and thus it will provide background information that will be updated whenever new HES data is available. The products will use the most recent ABI data as well. Thus, the joint product requirements typically carry the parameters of the ABI (spatial resolution, updates, etc.), considered HES data as the background field rather than imposing the product requirements on the HES as well as on the ABI.
4550	This approach will allow the GOES-R Program to develop and produce the basic system while pursuing the technologies required for improvements in parallel with the basic system. This means that funding for the development of the incremental upgrades is part of the original programs funding line and is not handled as a new start."	This approach will allow the GOES-R Program to develop and produce the basic system while pursuing the technologies required for improvements in parallel with the basic system. This means that funding for the development of the incremental upgrades are part of the original programs funding line and are not handled as a new start."
4551	In terms of the constellation, the P^3I improvements may be in terms of an additional instrument deployed after the start of the GOES-R series. In terms of the individual instruments, the improvements may be in terms of modularity of the instrument elements that, upon installation to subsequent instrument in the series, would yield improved performance for product	In terms of the constellation, the P^3I improvements may be in terms of an additional instrument deployed after the start of the GOES-R series. In terms of the individual instruments, the improvements may be in terms of modularity of the instrument elements that, upon installation to subsequent instrument in the series, would yield improved performance for product enhancement.

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	enhancement.	
4552	Requirements that fall into this category are listed below, along with a brief reason for the P^3I classification.	Requirements that fall into this category are listed below, along with a brief reason for the P^3I classification.
4554	True color imagery (Full Disk) Primarily met by other ABI bands, but could be met by P^3I Hyperspectral Imager	True color imagery (Full Disk) Primarily met by other ABI bands, but could be met by P^3I Hyperspectral Imager
6349	Sea & Lake Ice/Surface Temp: CONUS P^3I Hyperspectral Imager due to spatial resolution	Sea & Lake Ice/Surface Temp: CONUS P^3I Hyperspectral Imager due to spatial resolution
5854	Surface Type: Hemispheric P^3I Hyperspectral Imager and another far IR instrument and Microwave	Surface Type: Hemispheric P^3I Hyperspectral Imager and another far IR instrument and Microwave
5855	Ice of Land Origin (Icebergs and Ice Shelves): Hemispheric P^3I Hyperspectral Imager	Ice of Land Origin (Icebergs and Ice Shelves): Hemispheric P^3I Hyperspectral Imager
6357	Sea and Lake Ice: Edge P3I Hyperspectral Imager	Sea and Lake Ice: Edge P3I Hyperspectral Imager
5858	Sea Surface Temperature: Coastal Possibly P^3I Hyperspectral Imager	Sea Surface Temperature: Coastal Possibly P^3I Hyperspectral Imager
5859	Sea Surface Temperature: CONUS Possibly P^3I Hyperspectral Imager	Sea Surface Temperature: CONUS Possibly P^3I Hyperspectral Imager
5860	Sea Surface Temperature: Hemispheric Possibly P^3I Hyperspectral Imager	Sea Surface Temperature: Hemispheric Possibly P^3I Hyperspectral Imager
5861	Sea and Lake Surface Winds: CONUS Microwave	Sea and Lake Surface Winds: CONUS Microwave
5862	Sea and Lake Surface Winds: Hemispheric Microwave	Sea and Lake Surface Winds: Hemispheric Microwave
4583	Sea Surface Winds: Coastal Microwave	Sea Surface Winds: Coastal Microwave
4584	Sea Surface Winds: Coastal/Offshore Microwave	Sea Surface Winds: Coastal/Offshore Microwave

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4585	Sea Surface Winds: Hemispheric Microwave	Sea Surface Winds: Hemispheric Microwave
4586	Sea Surface Winds: Mesoscale Microwave	Sea Surface Winds: Mesoscale Microwave
4588	Total Electron Content (TEC) Requires Incoherent Scatter active Radar (interference problems) or in situ instrument	Total Electron Content (TEC) Requires Incoherent Scatter active Radar (interference problems) or in situ instrument
4589	Auroral Boundary Separate UV instrument or part of Hyperspectral Imager	Auroral Boundary Separate UV instrument or part of Hyperspectral Imager
4590	Airglow Emissions and Airglow P^3I Hyperspectral Instrument	Airglow Emissions and Airglow P^3I Hyperspectral Instrument
4592	Auroral Energy Deposition Separate UV instrument or part of Hyperspectral Imager	Auroral Energy Deposition Separate UV instrument or part of Hyperspectral Imager
4593	Auroral Imagery Separate UV instrument or part of P^3I Hyperspectral Imager	Auroral Imagery Separate UV instrument or part of P^3I Hyperspectral Imager
4594	Electron Density Profiles Requires Active Radar (interference problems) or in situ instrument	Electron Density Profiles Requires Active Radar (interference problems) or in situ instrument
4595	Ionospheric Scintillation Requires Incoherent Scatter active Radar (interference problems) or in situ instrument	Ionospheric Scintillation Requires Incoherent Scatter active Radar (interference problems) or in situ instrument
4596	Neutral Density Profile Requires Incoherent Scatter active Radar (interference problems) or in situ instrument	Neutral Density Profile Requires Incoherent Scatter active Radar (interference problems) or in situ instrument
4597	Optical Backgrounds P^3I Hyperspectral Instrument	Optical Backgrounds P^3I Hyperspectral Instrument
4600	Upper Atmospheric Neutral Winds Low quality at best with P^3I Hyperspectral	Upper Atmospheric Neutral Winds Low quality at best with P^3I Hyperspectral

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	imager; high quality winds requires separate complex instrument	imager; high quality winds requires separate complex instrument
5847	Downward Solar Insolation: TOA/CONUS Solar Irradiance Monitor	Downward Solar Insolation: TOA/CONUS Solar Irradiance Monitor
4601	Solar Flux: Spectral Irradiance Solar Irradiance Instrument	Solar Flux: Spectral Irradiance Solar Irradiance Instrument
4602	Solar Flux: Total Irradiance Solar Irradiance Instrument	Solar Flux: Total Irradiance Solar Irradiance Instrument
4603	Solar Radiation Imagery: Corona Images Solar Coronagraph	Solar Radiation Imagery: Corona Images Solar Coronagraph
4604	Solar Radiation Imagery: EUV Images Other new instrument, may be part of more complex Solar Coronagraph	Solar Radiation Imagery: EUV Images Other new instrument, may be part of more complex Solar Coronagraph
4605	Solar Radiation Imagery: Far IR and Optical Images Other new instrument; may be part of more complex Solar Coronagraph	Solar Radiation Imagery: Far IR and Optical Images Other new instrument; may be part of more complex Solar Coronagraph
4606	Solar Radiation Imagery: Magnetoheliograph Other new instrument or expanded magnetometer capabilities	Solar Radiation Imagery: Magnetoheliograph Other new instrument or expanded magnetometer capabilities
4607	Solar Radiation Imagery: Solar Radio Other new instrument or part of very (Total Flux and Burst Location) expanded Solar Irradiance Instrument	Solar Radiation Imagery: Solar Radio Other new instrument or part of very (Total Flux and Burst Location) expanded Solar Irradiance Instrument
4608	Absorbed Shortwave Radiation: Surface/ Hemispheric Proxy from ABI and Solar Irrad. Monitor	Absorbed Shortwave Radiation: Surface/ Hemispheric Proxy from ABI and Solar Irrad. Monitor
4609	Absorbed Shortwave Radiation: Surface/ Mesoscale Proxy from ABI and Solar Irrad. Monitor	Absorbed Shortwave Radiation: Surface/ Mesoscale Proxy from ABI and Solar Irrad. Monitor
4612	CH_4 Concentration HES, but requires extensive integration time time and competes with other tasks	CH_4 Concentration HES, but requires extensive integration time time and competes with other tasks
5851	CO_2 Concentration Other new instrument	CO_2 Concentration Other

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	or HES but requires extensive integration and competes with other tasks	new instrument or HES but requires extensive integration and competes with other tasks
4613	Ozone Layers HES, but research applications for product require more than two large layers	Ozone Layers HES, but research applications for product require more than two large layers
4674	Mission Management	Mission Management Space/Ground Communications
6860	Space/Ground Communications	
4686	Support alignment and instrument calibration across satellites in GOES-R series	Support alignment and instrument calibration of satellites in GOES-R series
4691	Generate and monitor GRB	Generate and monitoring GRB and a complete set of Level 1b data (GFUL)
6413	30-day local storage of level 0 data and products	30-day local storage of level 0 data and selected products
4695	Ground hardware and software component monitoring and reporting	Ground hardware and software element monitoring and reporting
6848	Interfacing with the Users through the User Services Functionality:	
6849	Data utilization	
6850	Mission Information Requests	
6414	Product Distribution Delivery of Archival Products to NESDIS Enterprise Infrastructure Interface Delivery of mission products and data to User portals	Product Distribution Delivery of Archival Products to NESDIS Enterprise Infrastructure Interface Delivery of products and Mission data to User portals
6416	Ground System Training Training for those who interact with the GOES-R system data and operations	Ground System User Interface and Training Interfacing with the user in area of data assimilation Training for those who interact with the GOES-R

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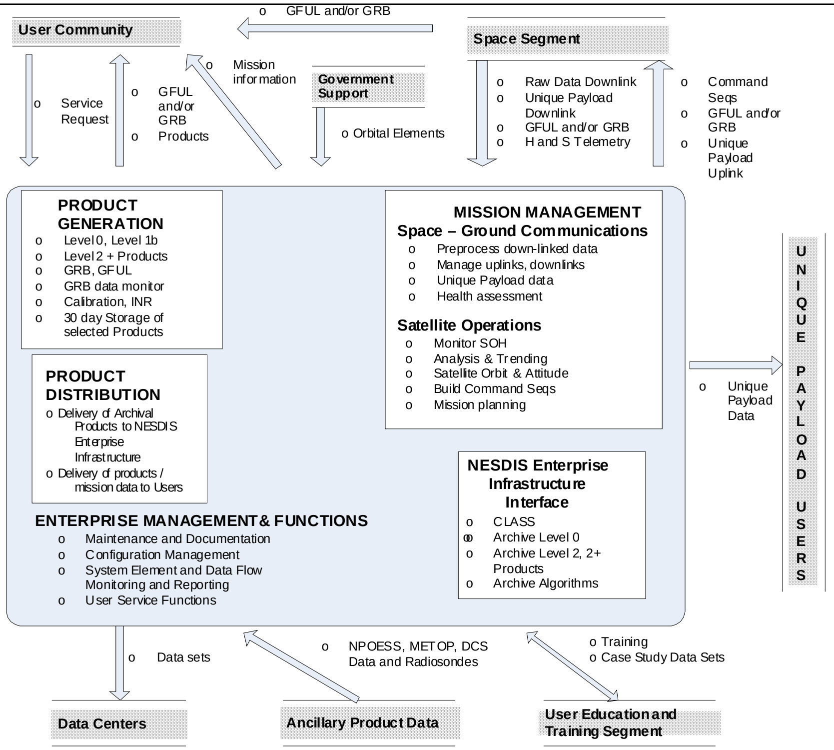
		system data and operation
4698	 Figure 5. Ground Segment Functional Diagram	Figure 5. Ground Segment Functional Diagram
4672	Figure 5. 'Ground Segment Functional Diagram' shows the high level functionality of the Segment. Note that this diagram is intended to be functional only, i.e., system architecture and specific data and operations flow paths are not indicated. Other parts of the NOAA infrastructure are shown in the shaded areas and the Ground Segment is shown as a rectangle. As indicated,	Figure 5. 'Ground Segment Functional Diagram' shows the high level functionality of the Segment. Note that this diagram is intended to be functional only, i.e., system architecture and specific data and operations flow paths are not indicated. Other parts of the NOAA infrastructure are shown in the shaded areas and the Ground Segment is shown as a rectangle. As indicated, the Ground

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	the Ground Segment provides the Mission Management (encompassing Space/Ground Communications and Satellite Operations); processes Raw Data (RD); encompasses Enterprise management and functions, archives and distributes data and products and interfaces with other Segments and organizations as required. The GFUL is shown being distributed through the space segment, but it could also be distributed over ground networks.	Segment provides the Mission Management (encompassing Space/Ground Communications and Satellite Operations); processes Sensor Data (SD); encompasses Enterprise management and functions, archives and distributes data and products and interfaces with other Segments and organizations as required. The GFUL is shown being distributed through the space segment, but it could also be distributed over ground networks.
4699	Note that the Unique Payload Services are the Low Rate Information Transmission (LRIT), Emergency Managers Weather Information Network (EMWIN), Data Collection Platform Interrogation (DCPI), Data Collection Platform Report (DCPR), Search and Rescue Satellite Aided Tracking (SARSAT), and NOAA Ships Ocean Data Support (Ships). At the time that the GOES-R series becomes operational, it is expected the types of Unique Payload Services will be the same as provided by the current system (GOES-N) (indicated as 'continuing service' in this document) with the exception of the Ships, which will be investigated further. It should be noted that some Unique Payload Services may need to provide additional data or functionality, which would require increased transmission rates or added Ground Segment operations for these services. Where necessary to be compatible with the primary services, frequency changes may be made for any or all of the Unique Payload Services.	Note that the Unique Payload Services are the Low Rate Information Transmission (LRIT), Emergency Managers Weather Information Network (EMWIN), Data Collection Platform Interrogation (DCPI), Data Collection Platform Report (DCPR), Search and Rescue Satellite Aided Tracking (SARSAT), and NOAA Ships Ocean Data Support (Ships). At the time that the GOES R series becomes operational, it is expected the types of Unique Payload Services will be the same as provided by the current system (GOES-N) (indicated as 'continuing service' in this document) with the exception of the Ships, which will be investigated further. It should be noted that some Unique Payload Services may need to provide additional data or functionality, which would require increased transmission rates or added Ground Segment operations for these services. Where necessary to be compatible with the primary services, frequency changes may be made for any or all of the Unique Payload Services.
4700	The Ground Segment will accommodate the increased amount and accuracy of the instrument data associated with the GOES-R series imager and sounder. Automatic or minimal manual operations are provided for routine daily operations such as schedule generation, scheduler processes, monitoring, and correction of spacecraft anomalies. The uplink rate supports large memory capacity instruments and spacecraft equipment. An integral part of the GOES-R Ground Segment is a System Element and Data Flow	The Ground Segment will accommodate the increased amount and accuracy of the instrument data associated with the GOES R series Imager and Sounder. Automatic or minimal manual operations are provided for routine daily operations such as schedule generation, scheduler processes, monitoring, and correction of spacecraft anomalies. The uplink rate supports large memory capacity instruments and spacecraft equipment. An integral part of the GOES R Ground Segment is a System Element and Data Flow

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	functionality that includes monitoring of data flows (command/telemetry and all mission data) within the ground system and automatic correction of anomalous network/system hardware and software behavior. Security measures are incorporated in the Ground Segment that prevent unauthorized access to command streams and provide positive isolation of control functions to reduce risks associated with controlling multiple spacecraft and payloads. Further descriptions of the functional groupings are located under their relevant sections below.	functionality that includes monitoring of data flows (command/telemetry and all mission data) within the ground system and automatic correction of anomalous network/system hardware and software behavior. Security measures are incorporated in the Ground Segment that prevent unauthorized access to command streams and provide positive isolation of control functions to reduce risks associated with controlling multiple spacecraft and payloads. Further descriptions of the functional groupings are located under their relevant sections below.
4628	Security shall be maintained in the GS communications so that there is no unlawful interference or malicious introduction of agents or data in the required transmissions and receptions of command streams. Security measures shall be incorporated in the GS to both prevent unauthorized access to command streams. *Discussion: Section 3.4.5.2 Command Encryption contains additional requirements that also pertain to mission security in the MM functional grouping of the GS. Section 1.4.3.3 contains a reference for NOAA IT security standards.*	Security shall be maintained in the GS communications so that there is no unlawful interference or malicious introduction of agents or data in the required transmissions and receptions of command streams. Security measures shall be incorporated in the GS to both prevent unauthorized access to command streams. Discussion: Section 3.4.5.2 Command Encryption contains additional requirements that also pertain to mission security in the MM functional grouping of the GS. Section 1.4.3.3 contains a reference for NOAA IT security standards.
4640	Discussion: The documentation will be developed to a level to support operations, sustainment, upgrade, modification, and re-procurement of all hardware and software. This documentation includes both COTS and custom software.	Discussion: The documentation will be developed to a level to support operations, sustainment, upgrade, modification, and re-procurement of all hardware and software. This documentation includes both COTS and custom software.
4644	This includes at a minimum functional operations description.	This includes at a minimum functional operations description. The GS should use vendor-supplied ICD for each electrical and data transfer media interface with the GS, including links to domestic, civilian, or military communications networks, and existing facilities at the SOCC, CDAs, processing centers and Direct Receive Sites.
6861	The GS shall use vendor-supplied ICD for each electrical and data	

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	transfer media interface with the GS, including links to domestic, civilian, or military communications networks, and existing facilities at the SOCC, CDAs, processing centers and Direct Receive Sites.	
5273	In light of the new systems and the new satellites, training shall be made available after the testbed delivery and prior to the start of integration and test for all who interact with the new systems and the data from the new systems.	In light of the new systems and the new satellites, training shall be made available for all who interact with the new systems and the data from the new systems.
5274	Discussion: Either videoconference training or in person training will be necessary for current and future satellite operators.	*Discussion*: Either videoconference training or in person training will be necessary for current and future satellite operators.
4650	Discussion: This includes downtime for maintenance.	Discussion: This includes downtime for maintenance.
4652	Discussion: This includes downtime for planned maintenance and other functions.	Discussion: This includes downtime for planned maintenance and other functions.
5029	The PG Grouping shall have an availability of 0.9999 (***TBR*****),** on a monthly basis, for components associated with the generation of Critical Life and Property products (**TBS)**. *Discussion: This includes downtime for planned maintenance and other functions.*	The PG Grouping shall have an availability of 0.9999 (***TBR*****),** on a monthly basis, for components associated with the generation of Critical Life and Property products (**TBS)**. Discussion: This includes downtime for planned maintenance and other functions.
6418	The Availability for the PD Grouping shall be at least 0.999 (TBR), where the Availability incorporates hardware elements, hardware functions, and software functions on a monthly basis. *Discussion: This includes downtime for maintenance.*	The Availability for the PD Grouping shall be at least 0.999 (TBR), where the Availability incorporates hardware elements, hardware functions, and software functions on a monthly basis. Discussion: This includes downtime for maintenance.
6855	The Ground Segment shall provide a GVAR rebroadcast format of a selected GOES-R series data subset through the GOES-N series satellites. *Discussion: Current GVAR users that may not be able to upgrade to the GRB data receivers have expressed an interest in receipt of*	

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	a GVAR-like data rebroadcast in the GOES-R timeframe.	
4658	Data latency between the measurement scene by the instrument and the receipt of the RD data on the ground shall be (TBD) for each instrument unless specified below.	Data latency between the measurement of the Sensor Data (SD) by the instrument and the collection of the SD data on the ground shall be (TBD) for each instrument unless specified below.
4666	The GS shall have an upgrade strategy that allows the insertion of the latest technology and operational capabilities to ensure the most cost effective technical and life cycle advantages during the life of the GOES-R program.	The GS shall have an upgrade strategy that allows the insertion of the latest technology and operational capabilities to ensure the most cost effective technical and life cycle advantages during the life of the GOES R program.
5041	Discussion: FOC will be nominally at final acceptance.	Discussion: FOC will be nominally at final acceptance.
4669	The GS shall support maintenance of operational interfaces with other applicable GOES-R Segments.	The GS shall support maintenance of operational interfaces with other applicable GOES R Segments.
330	The satellites shall be controlled from NOAA facilities.	The satellites will be controlled from NOAA facilities.
6588	Ground segment architecture shall provide prime operations and back-up capabilities.	Ground segment architecture will provide prime operations and back-up capabilities.
4713	The GS shall ingest, process, and store as a temporal archive, all raw data required to produce the full complement of GOES-R series data and products as projected for Final Operational Capability (FOC).	The GS shall ingest, process, and store as a temporal archive, all raw data required to produce the full complement of GOES R series data and products as projected for Final Operational Capability (FOC).
4714	Discussion: Final Operational Capability for products is defined in Section 3.5.	Discussion: Final Operational Capability for products is defined in Section 3.5.
6854	The Ground Segment shall autonomously maintain clocks within 10 microseconds of UTC (TBR).	
6734	A backup facility shall be provided that will meet the Mission Management, Product Generation, Product Distribution, and CDAS requirements.	A backup facility shall be provided that will be capable to meet the Mission Management, Product Generation, Product Distribution and CDAS requirements.
6498	Information passed between modules shall be performed by defined interfaces (formats and standards TBD).	Information passed between modules shall be done by defined interfaces (formats and standards TBD).
6835	The GS shall receive Service Requests from Users.	
6836	The GS shall respond to service requests with Service Responses.	
6837	The GS shall send Notifications to Users.	
6838	The GS shall provide to Users access to User service 24 hours per	

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	day, all days of the year for GOES R related products.	
6839	The GS shall retain a knowledge base of User data that will be accessible to User service providers.	
6840	The GS shall retain a knowledge base of technical data about the Ground Segment that will be accessible to User service providers	
6841	The GS shall provide product communication to Points of Presence (POP).	
6491	The GOES-R system shall make data available to the users portals. *Discussion: Making data available to the users portals may occur by a number of means including the rebroadcast of the partial data set of the GRB as described in section 2.10.8.3.1 and options for GFUL (described in section 3.5.7.4 on GOES-R Series Level 1b Data) ranging from push and pull capability to GFUL distribution. Push implies sending data to the user on a subscription basis, typically delivered to the user on a regular basis. Pull means users request data, not necessarily on a regular basis.*	GOES-R system shall make data available to the users portals. *Discussion:* Making data available to the users portals may occur by a number of means including the rebroadcast of the partial data set of the GRB as described in section 2.10.8.3.1 and options for GFUL (described in section 3.5.7.4 on GOES R Series Level 1b Data) ranging from push and pull capability to GFUL distribution. Push implies sending data to the user on a subscription basis, describing what will be delivered to the user on a regular basis. Pull means users request data, not necessarily on a regular basis.
4703	The functions and capabilities specified for the MM functional grouping shall be provided for the life of the GOES-R series mission(s).	The functions and capabilities specified for the MM functional grouping shall be provided for the life of the GOES R series mission(s).
4704	The MM functional grouping equipment, at minimum a single string, shall meet all requirements at the primary and backup CDAs and SOCC prior to start of spacecraft Integration and Test (I & T). *Discussion: Spacecraft I&T is likely to be scheduled 2 years prior to launch readiness of GOES-R.*	The MM functional grouping equipment, at minimum a single string, shall be in place and meet all requirements at the primary and backup CDAs and SOCC prior to start of spacecraft Integration and Test (I & T). *Discussion:* Spacecraft I&T is likely to be scheduled 2 years prior to launch readiness of GOES-R.
6501	The MM Segment for the GOES-R series of satellites, as foreseen at this time, is described below. This scenario may change as the	The MM Segment for the GOES R series of satellites, as foreseen at this time, is described below. This scenario may change as the

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	needs of the system are defined over time. If this is the case, subsequent versions of this document will reflect these changes.	needs of the system are defined over time. If this is the case, subsequent versions of this document will reflect these changes.
4708	The MM functional grouping shall support ILS, configuration control, enterprise management, integration, test, and verification activities concurrent with the operation of the primary, secondary, and any spare satellites in the GOES-R series and data processing operations.	The MM functional grouping shall support ILS, configuration control, enterprise management, integration, test, and verification activities concurrent with MM functional grouping operation of primary, secondary, and any spare satellites in the GOES-R series and data processing operations.
4710	The MM functional grouping shall accommodate the transition, on a non-interference basis, between legacy and GOES-R series operations. This transition shall apply to backup operations, continuity of data flow and processing, and ease of maintenance.	The MM functional grouping shall accommodate the transition, on a non-interference basis, between legacy and GOES R series operations. This transition shall apply to backup operations, continuity of data flow and processing, and ease of maintenance.
4711	The MM functional grouping shall overlap operations with GOES-R series and legacy satellites as necessary and on a non-interference basis.	The MM functional grouping shall overlap operations with GOES R series and legacy satellites as necessary and on a non-interference basis.
4724	The MM Grouping shall make available mission operational information to the user community through the User Service Functionality.	The MM Grouping shall make available mission operational information to the user community.
6502	MM functional grouping shall provide signal processing. *Discussion: Signal processing, as used here, is processing of the data stream associated with moving the data from the antenna(s) to PG. Data processing is processing of the data stream associated with the generation of Level 0, Level 1b, Level 2, and Level 2+ products from the data received from MM and other sources, as required.*	MM functional grouping shall provide signal processing. Discussion: Signal processing, as used here, is processing of the data stream associated with moving the data from the antenna(s) to PG. This processing will include routing the data according to instrument ID to the appropriate Product Generation port; data processing is processing of the data stream associated with the generation of Level 0, Level 1b, Level 2, and Level 2+ products from the data received from MM and other sources, as required.
4731	The MM grouping shall concurrently schedule primary and backup ground stations, process telemetry, and monitor the following CDA communications links for the GOES-R series:	The MM grouping shall concurrently schedule primary and backup ground stations, process telemetry, and monitor the following CDA communications links for the GOES R series:
4735	d. Raw data downlink (for sensor data)	d. Sensor Data downlink

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6738	f. Downlink for NOAA Ship Service	f. Downlink for NOAA Marine and Aviation Operations (NMAO) Aircraft and Ship Service
4739	Discussion: This pertains to reporting of any breaks in space to ground communication links.	Discussion: This pertains to reporting of any breaks in space to ground communication links.
4741	The MM grouping shall maintain an assessment of the space / ground communications functions. *Discussion: This pertains to real-time software and hardware.*	The MM grouping shall maintain an assessment of the space / ground communications functions. Discussion: This pertains to real-time software and hardware.
4752	**3.4.5.1.4.4 Raw Data Downlink**	3.4.5.1.4.4 Sensor Data Downlink
4753	The MM grouping shall receive raw data (RD) down-linked from the satellites in the GOES-R series according to the applicable CCSDS Recommendations to the extent they can be applied without conflict with other requirements of this document. *Discussion: Raw data is data collected by the instruments.*	The MM grouping shall receive SD down-linked from the satellites in the GOES-R series according to the applicable CCSDS Recommendations to the extent they can be applied without conflict with other requirements of this document.
4754	The MM grouping shall monitor and generate status on RD downlink functions.	The MM grouping shall monitor and generate status on SD downlink functions.
4761	**3.4.5.1.4.6 Raw Data Downlink (RD) Preprocessing**	3.4.5.1.4.6 Sensor Data Downlink (SD) Preprocessing
4762	The MM grouping shall ingest and preprocess received raw data in near real-time.	The MM grouping shall ingest and preprocess received SD in near real-time according to the applicable CCSDS Recommendations.
4769	Discussion: This will include material such as counting the number of frames by source and accounting for the forward error correction process.	Discussion: This will include material such as counting the number of frames by source and accounting for the forward error correction process.
6700	The MM grouping shall accept and transmit LRIT uplink messages.	The MM grouping shall accept, format, and transmit LRIT uplink messages.
6811	The MM grouping shall monitor the EMWIN downlink for signal quality and transponder performance.	
6812	The MM grouping shall monitor the DCPR downlink for signal quality and transponder performance.	
4787	Discussion: As discussed in Section 2.10.8.3.2.2, DCS users	*Discussion:* As discussed in Section 2.10.8.3.2.2, DCS users

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	project a large growth in usage, due to both more platforms and shorter report intervals. Additionally, the NWS estimates the value of DCS to be several billion dollars per year. These factors are likely to drive system loading near the capacity limits of the current DCPR system by the expected GOES-R launch date. This will impact not only the Space and Launch Segment but also the Ground System Segment.	project a large growth in usage, due to both more platforms and shorter report intervals. Additionally, the NWS estimates the value of DCS to be several billion dollars per year. These factors are likely to drive system loading near the capacity limits of the current DCPR system by the expected GOES R launch date. This will impact not only the Space and Launch Segment but also the Ground System Segment.
4794	The MM grouping shall forward health and safety telemetry to remote terminals (locations and interfaces TBD) in real-time.	The MM grouping shall forward state of health telemetry to remote terminals (locations and interfaces TBD) in real-time.
4802	The MM grouping shall provide all uplink(s) to the GOES-R Series including, as a minimum, commands, command loads, software, and data.	The MM grouping shall provide all uplink(s) to the GOES R Series including, as a minimum, commands, command loads, software, and data.
4816	**3.4.9.4 Command Schedule Development**	3.4.9.4 Activity Schedule Development
4817	The MM grouping shall generate command schedules of coordinated Satellite Operations, communications services, and supporting functions for each active satellite.	The MM grouping shall generate activity schedule of coordinated Satellite Operations, communications services, and supporting functions for each active satellite.
4824	The MM grouping shall generate pre-planned procedures to respond to anomalous conditions for Satellite Operations.	The MM grouping shall generate pre-planned responses to anomalous conditions for Satellite Operations.
4836	The MM grouping shall process and Health and Safety (H/S) telemetry from the GOES-R series in real-time.	The MM grouping shall process telemetry from the GOES-R series in real-time.
4840	The MM grouping shall process and analyze the satellite H/S telemetry.	The MM grouping shall process and analyze the satellite state-of-health (SOH) telemetry.
4848	The MM grouping shall verify that each command load has been correctly stored based on telemetry.	The MM grouping shall verify that each command has been correctly executed based on telemetry.
4873	Discussion: The MM grouping needs to be able to build a load for part or all of any table on the spacecraft. This is especially important when working with absolute timed command loads, which may be very large. It is necessary to build replacement commands with associated time and command numbers that are	*Discussion:* The MM grouping needs to be able to build a load for part or all of any table on the spacecraft. This is especially important when working with absolute timed command loads, which may be very large. It is necessary to build replacement commands with associated time and command numbers that are

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	constraint checked with the currently executing load (the copy of that load will be on the ground). The spacecraft will have a corresponding capability to accept and process the partial load.	constraint checked with the currently executing load (the copy of that load will be on the ground). The spacecraft will have a corresponding capability to accept and process the partial load.
6028	Discussion: Here analyses include (but is not limited to) standard statistical tests to determine statistically anomalous events. An example of a statistically anomalous event for a Gaussian distributed telemetry element would be the occurrence of seven increasing or decreasing values in a row. This rule is one of a set of rules known as the Western Electric rules.	*Discussion*: Here analyses include (but is not limited to) standard statistical tests to determine statistically anomalous events. An example of a statistically anomalous event for a Gaussian distributed telemetry element would be the occurrence of seven increasing or decreasing values in a row. This rule is one of a set of rules known as the Western Electric rules.
4896	***3.4.14.8 Conversion of H/S data to Engineering Units***	3.4.14.8 Conversion of SOH data to Engineering Units
4897	The MM grouping shall convert all H/S data to engineering units. *Discussion: This conversion is from digital counts to the relevant units, typically SI.*	The MM grouping shall convert all state of health data to engineering units. Discussion: This conversion is from digital counts to the relevant units, typically SI.
4907	The MM grouping shall maintain a current copy of the GOES-R Series satellite flight software.	The MM grouping shall maintain a current copy of the GOES-R Series satellite onboard software.
4908	The MM grouping shall archive each copy of the GOES-R series satellite flight software for the life of the GOES-R series.	The MM grouping shall archive each copy of the GOES-R series satellite on-board software for the life of the GOES-R series.
4920	**3.4.18 Raw Data Processing**	3.4.18 Sensor Data Processing
4921	The MM grouping shall provide all uplink(s) of operational data to the GOES-R Series including, as a minimum, calibration data and instrument parameters.	The MM grouping shall provide all uplink(s) of operational data to the GOES R Series including, as a minimum, calibration data and instrument parameters.
4927	**3.4.18.2 Decompress Raw Data**	3.4.18.2 Decompress and Route Raw Data

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4940	***3.4.19* GOES-R Series Rebroadcast Data (GRB)**	*3.4.19* GOES R Series Rebroadcast Data (GRB)
6029	Discussion: The two types of data that are currently being considered for GOES-R are the availability of a full set of this data (GFUL) and a rebroadcast of a subset of this data (GRB). GFUL contains the full ABI, HES, and other instruments Level 1b data sets, providing a data rate of more than 100 Mbps. This data could be sent via ground network or satellite rebroadcast. Discussion: GRB provides a replacement for the current Goes Variable Format Data (GVAR), as described in section 2.10.8.3.1.	Discussion: The two types of data that are currently being considered for GOES R are the availability of a full set of this data (GFUL) and a rebroadcast of a subset of this data (GRB). GFUL contains the full ABI, HES, and other instruments Level 1b data sets, providing a data rate of more than 100 Mbps. This data could be sent via ground network or satellite rebroadcast. Discussion: GRB provides a replacement for the current Goes Variable Format Data (GVAR), as described in section 2.10.8.3.1.
6030	Discussion: The Product Monitoring function(s) are intended to support not only product QA activities but also support troubleshooting of product anomalies occurring in other Ground System groupings. Toward this end, it is expected that the PM function will be replicated in all the Ground System groupings.	*Discussion:* The Product Monitoring function(s) are intended to support not only product QA activities but also support troubleshooting of product anomalies occurring in other Ground System groupings. Toward this end, it is expected that the PM function will be replicated in all the Ground System groupings.
4982	The MM grouping shall geo-locate all instrument data in geodetic latitude and longitude.	The MM grouping shall geo-locate all instrument data in geodetic latitude and longitude. The data shall be corrected for attitude within the accuracy specified for each instrument in this MRD.
4984	The MM grouping shall monitor earth pointing knowledge to determine actual versus predicted offsets.	The MM grouping shall use landmark target locations from the earth pointing knowledge database to apply to raw data to determine actual versus predicted offsets.
4996	**3.4.23.1 Ground Segment Interface to Space and Launch Segment**	3.4.23.1 Space Segment
6851	The GS interface to the Space and Launch Segment shall include at a minimum the Unique Payload Services (described under	

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	Section 3.4.6), the Telemetry and Command (described under section 3.4.5), the Raw Data Downlink (described under section 3.4.5), and the GRB uplink (described under section 3.4.5).	
6852	**3.4.23.2 Reserved**	
6426	PG shall provide data processing for the products listed in section 1.4.7. *Discussion: Data processing is processing of the data stream associated with the generation of Level 0, Level 1b, Level 2 and Level 2+ products based on the data received from MM.*	PG shall provide data processing for the products listed in section 1.4.7. Discussion: Data processing is processing of the data stream associated with the generation of Level 0, Level 1b, Level 2 and Level 2+ products based on the data received from MM.
6763	Science Algorithm shall be provided for the products specified in section 1.4.7. *Discussion: The government will provide research-grade algorithm as inputs to the development process.*	Science Algorithm shall be provided for the products specified in section 1.4.7. *Discussion:* The government will provide research-grade algorithm as inputs to the development process.
6432	Software systems consisting of product generation and quality assurance algorithms shall be validated with pre-launch simulated test datasets and post-launch real observations to demonstrate that GOES-R product threshold requirements, specified in the GOES-R MRD, are met.	Software systems consisting of science and quality assurance algorithms shall be validated with pre-launch simulated test datasets and post-launch real observations to demonstrate that GOES-R product threshold requirements, specified in the GOES-R MRD, are met.
6436	Software modules shall be developed using algorithms definitions and descriptions contained in the Algorithm Theoretical Basis Document (ATBD) algorithms (TBR), definitions, and any available basic research software.	Software modules shall be developed using Algorithm Theoretical Basis Document (ATBD) algorithms (TBR), definitions, and any available basic research software.
6437	Observing system performance monitoring and validation/verification systems shall be developed. *Discussion: These systems will support sustained operational*	Observing system performance monitoring and validation/verification systems shall be developed. Discussion: These systems will support sustained operational

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	monitoring and validation functions.	monitoring and validation functions.
6439	A 24 hours-a-day and 7 days-a-week testbed with operational equivalency system shall be provided. *Discussion: This system is intended to operate 24 hour a day and 7 days a week, although it may not be staffed.*	The capability to provide 24 hour a day and 7 days a week operational demonstration system shall be provided. *Discussion:* This system is intended to operate 24 hour a day and 7 days a week, although it may not be staffed.
6803	Discussion: It is envisioned that algorithm development will be a collaborative process between the contractor and the government.	*Discussion:* It is envisioned that algorithm development will be a collaborative process between the contractor and the government
6441	Simulated full spatial and temporal resolution GOES-R instrument level 1b radiance datasets will be generated. *Discussion: Initially these data sets will be generated by the government but may evolve to vendor-generated data sets.*	Simulated full spatial and temporal resolution GOES-R instrument level 1b radiance datasets will be generated. *Discussion:* Initially these data sets will be generated by the government but may evolve to vendor-generated data sets.
6728	Full spatial and temporal resolution GOES-R instrument level 1b radiance datasets shall be used to fully test all algorithms. *Discussion: Simulated data will be used until actual data is available at satellite checkout.*	Full spatial and temporal resolution GOES-R instrument level 1b radiance datasets shall be used to fully test all algorithms. *Discussion:* Simulated data will be used until actual data is available at satellite checkout.
6764	ATBDs that describe operational algorithms shall be provided for the products specified in section 1.4.7. *Discussion: The government will provide research-grade ATBD as inputs to the development process.*	ATBDs that describe operational algorithms shall be provided for the products specified in section 1.4.7. *Discussion:* The government will provide research-grade ATBD as inputs to the development process.
6451	Full documentation and software of all algorithms and operational-certified product generations systems shall be produced.	Full documentation and software of all algorithms and operational-certified product generations systems shall be produced.

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	Discussion: The documentation will include algorithm theoretical basis document, the algorithm implementation document, test datasets, source code and executable code.	Discussion: The documentation will include algorithm theoretical basis document, the algorithm implementation document, test datasets, source code and executable code.
5058	The data rates of the GOES-R instruments to the ground are estimated in section 2.10.8.1.2. The decoded and uncompressed data volume is TBD. The PG system shall be sized to produce products at two times (TBR) (THRESHOLD) and 10 times (TBR) (GOAL) the total product data rate of 1.5 Gbps (TBR). *Discussion: The minimum estimated uncompressed data rate is estimated to be ~50 Mbps for ABI, ~15 - 60 Mbps for HES, and total ~ 120 Mbps for all instruments. The minimum level 2 products estimate is ~150 Mbps. The maximum product data estimate is 1.5 Gbps.*	The data rates of the GOES-R instruments to the ground are estimated in section 2.10.8.1.2. The decoded and uncompressed data volume is TBD. The PG system shall be sized to produce products at two times (TBR) (THRESHOLD) and 10 times (TBR) (GOAL) the total product data rate of 1.5 Gbps (TBR). Discussion: The minimum estimated uncompressed data rate is estimated to be ~50 Mbps for ABI, ~15 - 60 Mbps for HES, and total ~ 120 Mbps for all instruments. The minimum level 2 products estimate is ~150 Mbps. The maximum product data estimate is 1.5 Gbps.
5059	Discussion: Currently the plan is to send the SIS and SEISS level 0 data to SEC from the GS, while meeting the 3 second latency requirement.	*Discussion:* Currently the plan is to send the SIS and SEISS level 0 data to SEC from the GS, while meeting the 3 second latency requirement.
6710	The PG Grouping shall generate the GOES-R series baseline products provided by the GOES-R data available at IOC.	The PG Grouping shall generate the GOES R series baseline products provided by the GOES-R data available at IOC.
5077	The PG Grouping shall ingest, process, and store all data required to produce the full complement of GOES-R baseline products for FOC.	The PG Grouping shall ingest, process, and store all data required to produce the full complement of GOES R baseline products for FOC.
5078	The PG Grouping shall generate the full complement of GOES-R baseline products for FOC.	The PG Grouping shall generate the full complement of GOES R baseline products for FOC.
5079	The PG Grouping shall be expandable to (TBD) growth in storage and processing capacity over the life of the GOES-R Series.	The PG Grouping shall be expandable to (TBD) growth in storage and processing capacity over the life of the GOES R Series.
6036	Discussion: The PG Grouping may experience at least a doubling	*Discussion:* The PG Grouping may experience at least a doubling

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	of products and services during its lifetime. Additionally, processing growth is expected as more sophisticated models and algorithms are developed to leverage the extensive bandwidth and coverage of the GOES-R instruments.	of products and services during its lifetime. Additionally, processing growth is expected as more sophisticated models and algorithms are developed to leverage the extensive bandwidth and coverage of the GOES R instruments.
4948	Discussion: The instruments will measure any calibration sources such as the blackbody, the visible calibrator if present, and space look responses to be used in determining corrective calibration coefficients to apply to the data. Algorithms will be supplied by the instrument vendors to meet specific detector response curves. The calibration coefficients are applied to the instrument data to support image navigation processing.	Discussion: The instruments will measure any calibration sources such as the blackbody, the visible calibrator if present, and space look responses to be used in determining corrective calibration coefficients to apply to the data. Algorithms will be supplied by the instrument vendors to meet specific detector response curves. The calibration coefficients are applied to the instrument data to support image navigation processing.
6815	The raw data shall be corrected for attitude within the accuracy specified for each instrument in this MRD.	
4950	The PG shall generate state-variables to include, at a minimum, orbit, attitude, gyro bias, and co-registration using inputs from the MM using vendor supplied algorithms. *Discussion: The ground processing determines the anticipated pointing against actual star and landmark measurements. Offsets are determined to support the proper selection and fixation of instrument sample pixels to a threshold ground sample distance. Any oversampling is removed in this process. From this process, the orbit and attitude knowledge based database is constantly updated. The performance of the spacecraft gyro system can be measured from this as well.*	The Ground Segment shall generate state-variables to include, at a minimum, orbit, attitude, gyro bias, and co-registration as used for determining geo-location of instrument samples (TBD). Discussion: The ground processing determines the anticipated pointing against actual star and landmark measurements. Offsets are determined to support the proper selection and fixation of instrument sample pixels to a threshold ground sample distance. Any oversampling is removed in this process. From this process, the orbit and attitude knowledge based database is constantly updated. The performance of the spacecraft gyro system can be measured from this as well.
6853	The PG shall perform geo-location of instrument samples (TBD).	
4964	Discussion: These are appended to each level 1b record to enable users to process the level-1b data independent of other spacecraft data. Typically, these variables include sampling mode, source,	Discussion: These are appended to each level-1b record to enable users to process the level-1b data independent of other spacecraft data. Typically, these variables include sampling mode, source,

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	temporal, and spectral identifications, relation to sun and moon position, and instrument viewing angle from nadir. The variables also reference external instrument supplied algorithm documentation.	temporal, and spectral identifications, relation to sun and moon position, and instrument viewing angle from nadir. The variables also reference external instrument supplied algorithm documentation.
4965	**3.5.7.2 GOES-R Series Level 1b Data**	3.5.7.2 GOES R Series Level 1b Data
6038	Discussion: The monitoring and data quality function(s) are intended to support not only product QA activities but also support troubleshooting of product anomalies occurring in other Ground System Groupings. Toward this end, it is expected that these functions will be replicated in all the Ground System Groupings.	*Discussion:* The monitoring and data quality function(s) are intended to support not only product QA activities but also support troubleshooting of product anomalies occurring in other Ground System Groupings. Toward this end, it is expected that these functions will be replicated in all the Ground System Groupings.
5083	Discussion: This transition legacy and concurrent operations will apply to backup operations, continuity of data flow and processing, product distribution, and ease of maintenance.	*Discussion*: This transition legacy and concurrent operations will apply to backup operations, continuity of data flow and processing, product distribution, and ease of maintenance.
6813	The PG Grouping shall provide system throughput capacity to support product generation functions within data latency requirements.	
5086	The system shall be capable of concurrently supporting the operational satellites of the constellation with the GOES-R payload and projected P^3I suite(s) as well as one additional satellite configuration in test mode. *Discussion: Note that data distribution can be accomplished using a different grouping if it is determined through concept studies and technology and risk trade analyses that this is more efficient.*	*Discussion:* The PG Grouping should provide system throughput capacity to support product generation and product distribution functions within data latency requirements. At a minimum, the system should be capable of concurrently supporting two operational satellite configurations with the GOES R payload and projected P^3I suite(s) as well as one additional satellite configuration in test mode. Note that data distribution can be accomplished using a different grouping if it is determined through concept studies and technology and risk trade analyses that this is more efficient.
6730	The PG grouping shall generate GRB data using a predefined set of rules (TBS) to compile a level 1b data subset of GFUL. *Discussion: The two types of data that are currently being*	The PG grouping shall generate GRB data using a predefined set of rules (TBS) to compile a level 1b data subset of GFUL. *Discussion: The two types of data that are currently being*

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	considered for GOES-R are the availability of a full set of this data (GFUL) and a rebroadcast of a subset of this data (GRB). GFUL contains the full ABI, HES, and other instruments Level 1b data sets, providing a data rate of more than 100 Mbps. This data could be sent via ground network or satellite rebroadcast. *Discussion: GRB provides a replacement for the current Goes Variable Format Data (GVAR), as described in section 2.10.8.3.1.*	*considered for GOES R are the availability of a full set of this data (GFUL) and a rebroadcast of a subset of this data (GRB). GFUL contains the full ABI, HES, and other instruments Level 1b data sets, providing a data rate of more than 100 Mbps. This data could be sent via ground network or satellite rebroadcast.* *Discussion: GRB provides a replacement for the current Goes Variable Format Data (GVAR), as described in section 2.10.8.3.1.*
5116	Discussion: All science data from other ground systems, including SDRs, should be appropriately time-stamped.	*Discussion:* All science data from other ground systems, including SDRs, should be appropriately time-stamped.
6457	The PG shall provide PG algorithms to the **NESDIS Enterprise Infrastructure Interface** functional grouping. *Discussion: This will consist of algorithm documentation as well as implementation software with full documentation. All versions of the algorithms will be archived.*	The PG shall provide PG algorithms to the **NESDIS Enterprise Infrastructure Interface** functional grouping. Discussion: This will consist of algorithm documentation as well as implementation software with full documentation. All versions of the algorithms will be archived.
6782	The PD Grouping shall operate concurrently with legacy operations with no operational disruption on fulfillment of any requirement. *Discussion: This transition legacy and concurrent operations will apply to backup operations, continuity of data flow and processing, product distribution, and ease of maintenance.*	The PD Grouping shall operate concurrently with legacy operations with no operational disruption on fulfillment of any requirement. *Discussion*: This transition legacy and concurrent operations will apply to backup operations, continuity of data flow and processing, product distribution, and ease of maintenance.
5233	Users shall include, at a minimum, NOAA's National Weather Service - including: NCEP Units of TPC in Miami, SPC in Norman, AWC in Kansas City (TBS), OPC, HPC, CPC, EMC in Camp Springs (TBS), SEC in Boulder (TBS), NCEP Modeling Centers in Fairmont West Virginia (TBS), NWSTG in Silver Spring (TBS) and its backup at TBS, DoD in AFWA in Omaha (TBS), FNMOC in Monterey (TBS), NESDIS in Camp Springs	Users shall include, at a minimum, AWIPS SBN (via NWSTG), Miami NHC and TPC, Norman SPC, Kansas City AWC, Air Force Weather Agency (Offut AFB), Bowie and Camp Springs NCEP, NOAAPORT providers, and the NWSTG.

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	and Suitland (TBS); other portions of NOAA (TBS); Academia (TBS).	
6492	GOES-R users' needs for a push/pull capability for GOES-R data shall be supported to address large volume users and smaller volume users.	GOES-R User Interface needs for a push/pull capability for GOES-R data shall be supported to address large volume users and smaller volume users.
6493	Software required to interface with the PD grouping shall be generated and maintained to meet the user needs.	Software required to permit interface with the GOES-R data shall be generated and maintained to meet the User interface needs.
6494	The PD shall process product formats including, at a minimum (TBR), GIF, Text, BUFR, GRIB, Binary, JPEG, NetCDF, and McIDAS files or their replacement file formats. *Discussion: This does not imply that all data formats envisioned by the user will be supported. However, common formats and replacement file formats for the typical formats listed above will be supported.*	The User Interface shall process product formats including, at a minimum (TBR), GIF, Text, BUFR, GRIB, Binary, JPEG, NetCDF, and McIDAS files or their replacement file formats. Discussion: This does not imply that all data formats envisioned by the user will be supported. However, common formats and replacement file formats for the typical formats listed above will be supported.
6495	The users' need for documentation of the data formats and interface software shall be supported through documentation of data formats and interface software.	The User interface need for documentation of the data formats and interface software shall be supported through documentation of data formats and interface software.
6496	The users' need for configuration management of the data formats and interface software shall be supported through documentation of data formats and interface software.	The User interface need for configuration management of the data formats and interface software shall be supported through documentation of data formats and interface software.
6469	The PD Grouping shall deliver products to the NESDIS Enterprise Infrastructure Interface within time frames that allow the products to be made available for access within GOES-R end-to-end latencies (**TBS**).	The PD Grouping shall deliver products to the NESDIS Enterprise Infrastructure Interface within time frames that allow the products to be made available for access within GOES R end-to-end latencies (**TBS**).
6466	The PD grouping shall transmit other science data used in and produced by PG processing to CLASS.	The PD grouping shall transmit other science data used in and produced by PG processing to Data Centers via the NESDIS Infrastructure Interface.

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6477	**3.6.3.2 Reserved**	3.6.3.2 User Interface
5166	In the GOES-R era an upgraded Comprehensive Large Array-data Stewardship System (CLASS), or its follow-on, will be in place to handle the extensive types and volume of environmental data required to be archived and accessed. A more detailed description and a 5-year plan is available for CLASS. * This system is a re-engineering and upgrade of current archive capabilities serving the National Data Centers (NCDC, NGDC, NODC). Data currently archived includes NWS NEXRAD, ASOS, radiosonde, climatic, and model data; NOS hydrographic data, bathymetric maps, and topographic maps; NMFS (**TBS**), OAR solar radiation, aircraft reports, wind profiler data, and geologic data; NOAA-NESDIS POES and GOES data; and DoD DMSP data. The volume of data in 2000 was 1,000 TB annually. The added requirements for archiving and providing access to NASA EOS, NPOESS NPP, METOP, and full NPOESS data in the 2005 - 2012 timeframe will increase the volume to 13,000 TB annually.	In the GOES R era an upgraded Comprehensive Large Array-data Stewardship System (CLASS), or its follow-on, will be in place to handle the extensive types and volume of environmental data required to be archived and accessed. A more detailed description and a 5-year plan is available for CLASS. * This system is a re-engineering and upgrade of current archive capabilities serving the National Data Centers (NCDC, NGDC, NODC). Data currently archived includes NWS NEXRAD, ASOS, radiosonde, climatic, and model data; NOS hydrographic data, bathymetric maps, and topographic maps; NMFS (**TBS**), OAR solar radiation, aircraft reports, wind profiler data, and geologic data; NOAA-NESDIS POES and GOES data; and DoD DMSP data. The volume of data in 2000 was 1,000 TB annually. The added requirements for archiving and providing access to NASA EOS, NPOESS NPP, METOP, and full NPOESS data in the 2005 - 2012 timeframe will increase the volume to 13,000 TB annually.
5167	The CLASS is developed to accommodate significant increases in data while allowing for more efficient and integrated capabilities among the data centers. The CLASS program maintains its own requirements documents in which the GOES-R portions will need to be included. While the CLASS GOES ingest function needs to be able to handle the current 2.1 Mb/s GOES data rate, the CLASS designers are fully aware of the need for the ingest function to scale up to GOES-R data rates expected to be 150 Mb/s or more by	The CLASS is developed to accommodate significant increases in data while allowing for more efficient and integrated capabilities among the data centers. The CLASS program maintains its own requirements documents in which the GOES R portions will need to be included. While the CLASS GOES ingest function needs to be able to handle the current 2.1 Mb/s GOES data rate, the CLASS designers are fully aware of the need for the ingest function to scale up to GOES-R data rates expected to be 150 Mb/s or more by the

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	the GOES-R timeframe.	GOES-R timeframe.
6478	Discussion: The Archive and Access functionality may be performed by the Comprehensive Large Array and Stewardship System (CLASS). CLASS exists and contains data from GOES and other observing systems, including POES and in the future NPOESS. The GOES-R Archive and Access needs are discussed below. If they are not met by CLASS in the GOES-R timeframe, the GOES-R Program Office will consider adding the Archive and Access function to the GOES-R Acquisition and Operations contract.	Discussion: The Archive and Access functionality may be performed by the Comprehensive Large Array and Stewardship System (CLASS). CLASS exists and contains data from GOES and other observing systems, including POES and in the future NPOESS. The GOES-R Archive and Access needs are discussed below and must be met. If they are not met by CLASS in the GOES-R timeframe, they must be met by the GOES-R system.
6454	The development of the product formats needed for archive shall be per the GOES-R to CLASS IRD (TBD).	The development of the product formats needed for archive per the GOES-R to CLASS IRD (TBD).
5193	The AA functionality shall ingest, process, and store all data required to produce the full complement of GOES-R Series products as projected for FOC.	The AA functionality shall ingest, process, and store all data required to produce the full complement of GOES R Series products as projected for FOC.
5194	The AA functionality System Elements shall be expandable to permit (TBD) growth in storage and processing capacity over the life of the GOES-R Series.	The AA functionality System Elements shall be expandable to permit (TBD) growth in storage and processing capacity over the life of the GOES R Series.
5197	The AA functionality shall include the GOES-R Series with no operational disruption on fulfillment of any requirements.	The AA functionality shall include the GOES R Series with no operational disruption on fulfillment of any requirements.
5198	Discussion: This transition shall apply to backup operations, continuity of data flow and processing, access request processing, data and information distribution, and ease of maintenance.	Discussion: This transition shall apply to backup operations, continuity of data flow and processing, access request processing, data and information distribution, and ease of maintenance.
5202	Discussion: Data distribution can be accomplished using a different segment if it determined through concept studies and technology and risk trade analyses that this is more efficient.	*Discussion:* Data distribution can be accomplished using a different segment if it determined through concept studies and technology and risk trade analyses that this is more efficient.
5213	**3.7.2.2.3.1 Archive and Access interfaces needed for GOES-R User Education and Training**	3.7.2.2.3.1 Archive and Access interfaces needed for GOES-R User Interface
6485	Discussion: The Merged Processing functionality will grow for the GOES-R timeframe. By the GOES-R timeframe data from other	Discussion: The Merged Processing functionality will grow for the GOES-R timeframe. By the GOES-R timeframe data from other

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	observing systems including non-GOES GEO satellites and LEO satellites such as those in NPOESS will be used to make operational merged or “blended” products. GOES-R products that utilize multiple instruments that are part of the GOES-R series are still considered GOES-R products, not merged products and will be made by GOES-R Ground Segment PG functional grouping. The small number of GOES-R products that require inputs from either NWP prediction, ASOS, radiosondes, and Doppler radar under clouds will also be made by GOES-R Ground Segment PG functional grouping. The GOES-R detailed requirements for the interface to the GOES-R timeframe system are TBS. **GOES-R Product Additional Data needed for GOES-R product** Cloud Base Height: ASOS over CONUS, altimeters, radiosondes, NWP CONUS, Hemis, and Meso. Cloud Layers Heights and Thicknesses: ASOS over CONUS, altimeters, radiosondes, NWP CONUS, Hemis, and Meso Cloud Top Pressure: Radiosondes, NWP CONUS, Hemis, and Meso. Imagery: All weather: Day/Night Hemis, Until Microwave is present, ASOS over CONUS altimeters, radiosondes, NWP Turbulence: Hemis and Meso: ASOS over CONUS, altimeters, radiosondes, NWP Visibility: Coastal and Hemispheric ASOS over CONUS, altimeters, radiosondes, NWP Rainfall Potential: Until Microwave is present, ASOS over CONUS, altimeters, radiosondes, NWP, and doppler radar over CONUS.	observing systems including non-GOES GEO satellites and LEO satellites such as those in NPOESS will be used to make operational merged or “blended” products. GOES-R products that utilize multiple instruments that are part of the GOES-R series are still considered GOES-R products, not merged products and will be made by GOES-R Ground Segment PG functional grouping. The small number of GOES-R products that require inputs from either NWP prediction, ASOS, radiosondes, and Doppler radar under clouds will also be made by GOES-R Ground Segment PG functional grouping. The GOES-R detailed requirements for the interface to the GOES-R timeframe system are TBS. **GOES-R Product Additional Data needed for GOES-R product** Cloud Base Height: ASOS over CONUS, altimeters, radiosondes, NWP CONUS, Hemis, and Meso. Cloud Layers Heights and Thicknesses: ASOS over CONUS, altimeters, radiosondes, NWP CONUS, Hemis, and Meso Cloud Top Pressure: Radiosondes, NWP CONUS, Hemis, and Meso. Imagery: All weather: Day/Night Hemis, Until Microwave is present, ASOS over CONUS altimeters, radiosondes, NWP Turbulence: Hemis and Meso: ASOS over CONUS, altimeters, radiosondes, NWP Visibility: Coastal and Hemispheric ASOS over CONUS, altimeters, radiosondes, NWP Rainfall Potential: Until Microwave is present, ASOS over CONUS, altimeters, radiosondes, NWP, and doppler radar over CONUS.

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	Rainfall Rate / Quant. Precip. Estimate Doppler radar useful under clouds Pressure Profile: Mesoscale Radiosonde, NWP models Downward Longwave Radiation: Surface ASOS over CONUS, altimeters, radiosondes, NWP Microburst winds: Radiosondes	Rainfall Rate / Quant. Precip. Estimate Doppler radar useful under clouds Pressure Profile: Mesoscale Radiosonde, NWP models Downward Longwave Radiation: Surface ASOS over CONUS, altimeters, radiosondes, NWP Microburst winds: Radiosondes
5236	**4 User Education and Training Segment**	4 User Interface Segment
5231	***4.1 Reserved***	4.1 User Interface(s)
6490	***4.2 Reserved***	4.2 User Interface Needs
337	Support shall be developed for the generation of government-provided public outreach plans.	Support will be available for the generation of government-provided public outreach plans.
5241	The User Education and Training Segment (UET) will validate the operability of training tools.	The User Interface Segment (UIS) will validate the operability of training tools
5242	The UET will revalidate the appropriateness of the training tools every TBS years.	The UIS will revalidate the appropriateness of the training tools on every TBS years.
5243	The UET will perform surveys to determine user satisfaction.	The UIS will perform surveys to determine user satisfaction.
5259	Discussion: Space-based remote sensing is going through a major increase in observing capability over the next decade. One major challenge is making sure that managers and users are aware of the latest advances in space-based observing capabilities. The goal is to transfer research results based on atmospheric remote sensing data into NWS operations. There is also the opportunity to expand public outreach.	*Discussion:* Space-based remote sensing is going through a major increase in observing capability over the next decade. One major challenge is making sure that managers and users are aware of the latest advances in space-based observing capabilities. The goal is to transfer research results based on atmospheric remote sensing data into NWS operations. There is also the opportunity to expand public outreach.
5261	Discussion: The GOES Users subcommittee on Training, Education and Outreach proposes that the impending shortfall in	*Discussion:* The GOES Users subcommittee on Training, Education and Outreach proposes that the impending shortfall in

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	providing training and education resources be addressed. This need for education and training can be met by establishing expanded satellite training as part of the Virtual Institute for Satellite Integration Training (VISIT) program. The mission of the VISIT program is to accelerate the transfer of research results based on environmental remote sensing data into NOAA's operations using distance education techniques. NOAA's National Environmental Satellite Data and Information Service and National Weather Service cosponsor the VISIT program. The primary distance training tool used by VISIT is synchronous teletraining.	providing training and education resources be addressed. This need for education and training can be met by establishing expanded satellite training as part of the Virtual Institute for Satellite Integration Training (VISIT) program. The mission of the VISIT program is to accelerate the transfer of research results based on environmental remote sensing data into NOAA's operations using distance education techniques. NOAA's National Environmental Satellite Data and Information Service and National Weather Service cosponsor the VISIT program. The primary distance training tool used by VISIT is synchronous teletraining.
5263	Discussion: The GOES Users Committee has proposed that the satellite training activities be expanded to provide comprehensive distance learning courses that produce satellite experts in all parts of NOAA's operational programs. The teletraining conducted by the VISIT program (<http://www.cira.colostate.edu/ramm/visit/visithome.asp>) will be one of the training components used for these comprehensive earth observing satellite courses. The training courses will be incorporated into the Department of Defense (DOD) programs and will be included in the World Meteorological Organization's Virtual Laboratory for Education and Training in Satellite Meteorology.	*Discussion:* The GOES Users Committee has proposed that the satellite training activities be expanded to provide comprehensive distance learning courses that produce satellite experts in all parts of NOAA's operational programs. The teletraining conducted by the VISIT program (<http://www.cira.colostate.edu/ramm/visit/visithome.asp>) will be one of the training components used for these comprehensive earth observing satellite courses. The training courses will be incorporated into the Department of Defense (DOD) programs and will be included in the World Meteorological Organization's Virtual Laboratory for Education and Training in Satellite Meteorology.
5270	**4.3.3 Public Outreach to be performed by NOAA**	4.3.3 Public Outreach Public outreach shall be performed by NOAA
5271	Discussion: Public outreach is an important activity because it shows the public the source of the weather data, while generating interest in meteorology, atmospheric research, and space weather research, oceanography, and environmental monitoring. Training	*Discussion:* Public outreach is an important activity because it shows the public the source of the weather data, while generating interest in meteorology, atmospheric research, and space weather research, oceanography, and environmental monitoring. Training

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	courses that are generated for NOAA employees (see section above) could be easily translated to the general public for any of several uses including NOAA web pages, science museum displays, or visitor centers or lobby kiosks. Classroom lessons that could be downloaded from NOAA pages or web pages catering to teachers would clearly be useful for everyday teaching or for special guest teachers and parents.	courses that are generated for NOAA employees (see section above) could be easily translated to the general public for any of several uses including NOAA web pages, science museum displays, or visitor centers or lobby kiosks. Classroom lessons that could be downloaded from NOAA pages or web pages catering to teachers would clearly be useful for everyday teaching or for special guest teachers and parents.
5276	Data products from the Ground Segment and interesting cases from the NESDIS Infrastructure Interface shall be used in remote teletraining.	Data products from the Ground Segment and interesting cases from the AAS shall be used in remote teletraining.
5277	Data products from the Ground Segment and interesting cases from the NESDIS Infrastructure Interface shall be used in public outreach.	Data products from the Ground Segment and interesting cases from the AAS shall be used in public outreach.
6842	**Service Request** - any type of request for information or service including requests for products.	
6843	**Service Response** - a response to the customer regarding a service request.	
6844	**Notifications** - unsolicited communications from the Ground Segment to Users. These messages may be communicated using a variety of communication methods.	
5357	(NOTE: The GPRD-1 was signed in June 2004. The GPRD-1a is in draft form and is evolving. The tables posted with the document will be called Appendix A.)	(NOTE: The GPRD-1 was signed in June 2004. The tables will be posted with the document and will be called Appendix A.)
6317	Appendix B: Radio Frequency Allocation STATUS November 22, 2004 NESDIS POSITION Dr. Dave McGinnis NESDIS RF Manager	Appendix B will be updated with the details of a new frequency request for the MRD-2B.

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	Mr. Roger Heymann GOES-R Communications Engineer GOES-R ERA RF SPECTRUM AVAILABILITY (SUBJECT TO LIMITATIONS FOUND IN COMMENTS and NOTES) Notes for table below: #1. Guard bands required relative to IPO (NPOESS) use above 1698 MHz, and NESDIS (GOES) use below 1698 MHz to avoid RFI. # 2. NOAA envisions a spec requiring the use of SRRC filters to allow NOAA to get the BW authorization necessary. NOAA requires out-of-band filtering. #3. NOAA envisions a spec for directional antenna focused on the CDA stations, which NOAA believes is necessary to get its authorization. Wallops is the prime NESDIS CDA station. NASA GSFC is the GOES 75ºW backup CDA station. Fairbanks is the 135º/137ºW backup CDA station. #4. NTIA oversees use of RF spectrum by all federal agencies. #5. Earth Exploration Satellite-Service (EESS) - a radio communication payload services between earth stations and one or more space stations. Per ITU definition, Metsats are a subset of EESS used for meteorological purposes. #6. ITU PFD limits for EESS and Metsat services must be met. #7. NESDIS is working to obtain operational X-band approval. If this fails it will attempt to obtain Ku (18.1-18.3 GHz) and/or Ka (25.5-27 GHz) operational approval.	

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6873	Option #	
6874	Sensor DOWNLINK to Wallops (prime), TBD (backup), GSFC (back-up)	
6875	NESDIS Comments	
6877	**#1**	
6878	7450-7550 MHz	
6879	Stage 1 petition filed by NESDIS with NTIA. Use of this spectrum not recommended by NTIA due to electromagnetic compatibility and sharing issues between proposed GOES earth station receivers and other authorized users of the band. The main concern is protection of the GOES receivers from Government terrestrial fixed transmitters and coordination with military fixed satellites to avoid harmful interference from GOES into the military satellites and their earth receivers. Coordination with military spectrum office (DISA) continuing. In order to protect the terrestrial services, the power flux-density limits of TABLE **21-4** of the Radio Regulations need to be met, i.e. between -152 and -142 dB(W/m^2) per 4 kHz bandwidth, depending on angle of arrival.	
6881	**#2**	
6882	8215-8400 MHz X-band	
6883	Stage 1 petition filed by NESDIS with NTIA. Use of this spectrum requires a small satellite separation between DOD DSCS at 135º W and GOES, as such, NOAA investigating relocating to 137º W. This sharing situation is between the GOES satellite transmitter and the DSCS satellite receiver. Analysis completed by Aerospace for NOAA indicates that a 2º separation between GOES and DSCS satellites should be sufficient to avoid harmful interference. Per	

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	NTIA, NOAA coordination with DOD critical. Also per NTIA NOAA coordination with Fixed Sat. Ser. and Earth Exploration Satellite Service (EESS), NASA EESS, DOC EESS, non-gov't EESS space systems and gov't. Government and non-Government non-geostationary EESS networks operate in the band 8025-8400 MHz. An analysis will be needed to determine the sharing compatibility between GSO EESS and NGSO EESS networks. NASA concerned about adjacent RFI from 8025-8400 MHz users into its Goldstone receiving earth station operating in the space research service (deep space)in the band 8400-8450 MHz; this suggests a guard band is needed. Further, ITU-R Recommendation SA.1157 states maximum interference power levels to earth-station receivers: PFD (-255.1 dB(W/m^2 Hz)) and PSD (-220.9 dB(W/Hz)) 8400MHz. This limit would have to be met at the Goldstone earth station. In order to protect the terrestrial services, the power flux-density limits of TABLE **21-4** of the Radio Regulations need to be met, i.e. between -150 and -140 dB(W/m^2) per 4 kHz bandwidth, depending on angle of arrival.	
6885	**#3**	
6886	8025-8175 MHz X-band	
6887	Stage 1 petition filed with NTIA. Use of this spectrum requires a small satellite separation between DOD DSCS at 135º W and GOES, as such NOAA investigating relocating to 137º W. This sharing situation is between the GOES satellite transmitter and the DSCS satellite receiver. Analysis completed by Aerospace for NOAA indicates that a 2º separation between GOES and DSCS satellites should be sufficient to avoid harmful interference. Per NTIA, NOAA coordination with DOD critical. Also per NTIA, NOAA coordination required with FSS and EESS, NASA EESS,	

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	DOC EESS, non gov’t EESS space systems and gov’t. Government and non-Government non-geostationary EESS networks operate in the band 8025-8400 MHz. An analysis will be needed to determine the sharing compatibility between GSO EESS and NGSO EESS networks. NASA concerned about RFI from 8025-8400 MHz users into deep space research network, Goldstone earth station, at 8400-8450 MHz. Further, ITU recommended PFD and PSD interference limits must be met above 8400MHz,see #1 above. In order to protect the terrestrial services, the power flux-density limits of TABLE **21-4** of the Radio Regulations need to be met, see #2 above.	
6889	#4	
6890	18.1-18.3 GHz Ku-band	
6891	Stage 1 petition filed with NTIA. NESDIS pursuing X band with higher priority. On advice of NTIA, to be considered if NESDIS is unsuccessful in obtaining access to 8 GHz spectra. Per NTIA, technology and rain fade issues have to be considered. NTIA has indicated recommended coordination with non-government terrestrial systems in band within a to-be-determined distance of the GOES receiving earth station(s). In order to protect the terrestrial services, the power flux-density limits of TABLE **21-4** of the Radio Regulations need to be met, i.e. between -115 and -105 dB(W/m^2) per 1 MHz bandwidth, depending on angle of arrival.	
6893	#5	
6894	25.25-27.0 MHz Ka-band	
6895	On advice of NTIA, to be considered if NESDIS is unsuccessful in obtaining access to 8 GHz spectra. Per NTIA, technology and rain fade issues have to be considered. NTIA has indicated	

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	recommended coordination. Within US, government would be primary spectrum user. New band allocated to EESS. In order to protect the terrestrial services, the power flux-density limits of TABLE **21-4** of the Radio Regulations need to be met, i.e. between -115 and -105 dB(W/m^2) per 1 MHz bandwidth, depending on angle of arrival.	
6897		
6898		
6899		
6901	Option #	
6902	Processed Data UPLINK to GOES from CDA station(s)	
6903	Comments	
6905	#1	
6906	7190-7235 MHz X-band	
6907	NESDIS has not yet submitted a Stage 1 petition to NTIA. Will ask for 12 MHz BW, only. Concern with deep space network, informal discussions have been initiated between NOAA and NASA, and are ongoing. No issue with DOD and thus no issue with DSCS and GOES satellite separation at 135º W. NESDIS preferred option. The band is not currently allocated to the EESS and may require either a waiver or a modification to the national allocation table. Expect an unfavorable finding from ITU for station classes EW (EESS space station) and EM (metsat space station).	
6909	#2	
6910	8175-8215 MHz X-band	
6911	Stage 1 petition filed with NTIA. This requires maximum separation between GOES at 135º W and DSCS at 135º W. Amount of separation under study by Aerospace Corp., but greater	

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	than that required for either 8025-8175 or 8215-8400 MHz downlink. [Note: Roger, doesn't Aerospace analysis indicate necessary separation?] Per NTIA, NOAA coordination with DOD critical. NASA concerned about adjacent RFI from 8025-8400 MHz users into its deep space research network at Goldstone in the band 8400-8450 MHz. Discussions on both issues are currently ongoing with appropriate agencies.	
6913	#3	
6914	2025-2035 MHz S-band	
6915	Current GOES S-band uplink allocation protected for 3 CDA stations via footnote US222. Per footnote US346, except for that provided by US222, use of the 2025-2110 MHz band requires coordination with the Television Broadcast Auxiliary Service, the Cable Television Relay Service or the Local Television Transmission Service, in order no to constrain their deployment.	
6917		
6918		
6919		
6921	Option #	
6922	Global Processed DOWNLINK data stream from GOES "Globally"	
6923	Comments	
6925	#1	
6926	1683-1698 MHz L-band	
6927	1683-1695 MHz for high resolution GRB data is available. 1695-1698 MHz for other broadcast downlinks. CDA T&C downlink can be located in 1670-1675 MHz band. MOU between NPOES and GOES, signed in February 2004, expands GOES L-band spectrum by an additional 3 MHz to 1698 MHz. ITU maximum	

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	PFD requirements for the radio astronomy band below 1670 MHz are quite strict and must be met. In order to protect the terrestrial services, the power flux-density limits of TABLE **21-4** of the Radio Regulations need to be considered; due to the lack of terrestrial services operating in the US, these limits may be able to be waived. There is also a power flux density limit to protect Metaids (radiosondes), but this may be waived as well since it has been shown that Metaids and Metsats cannot share spectrum.	